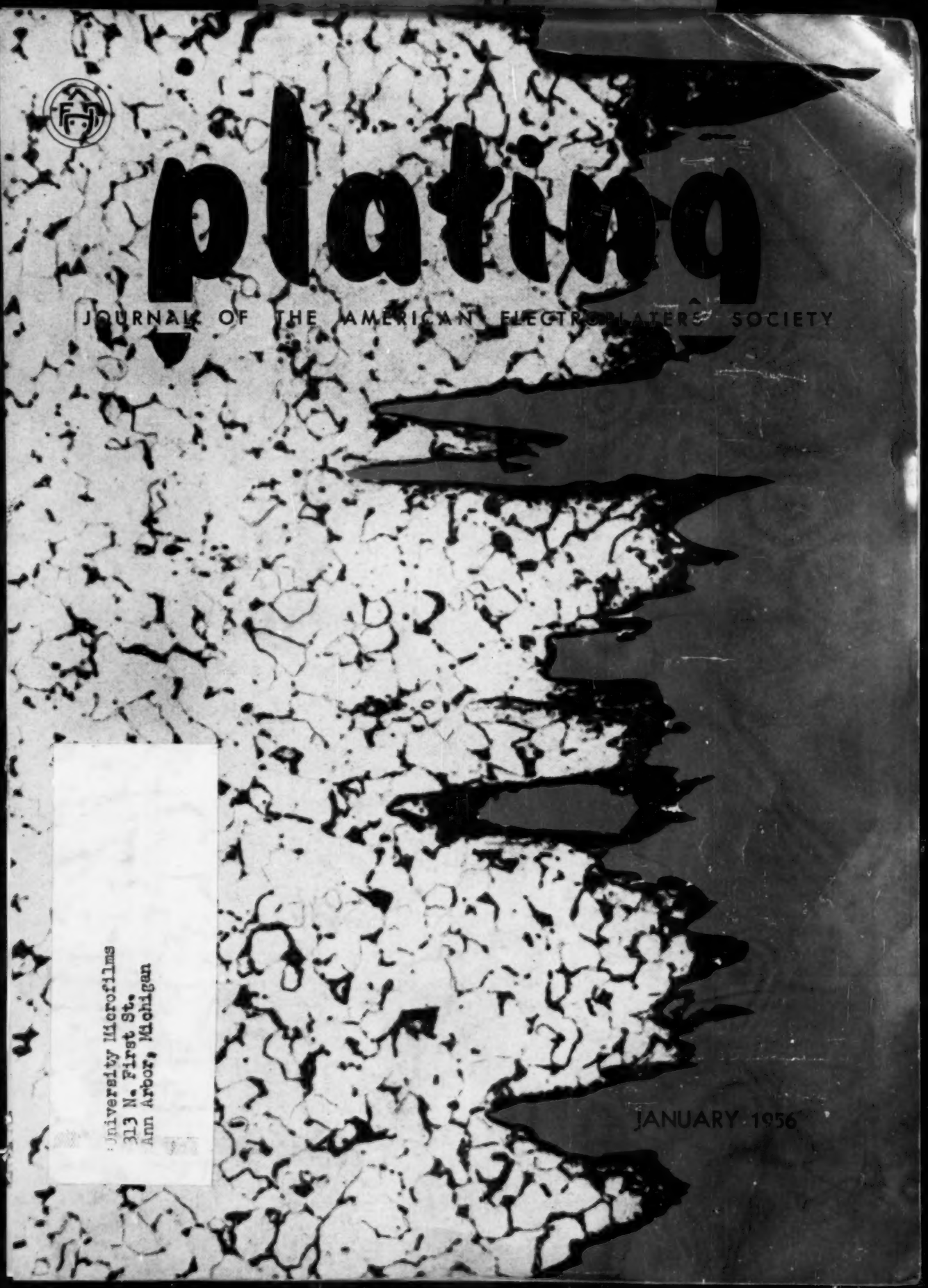

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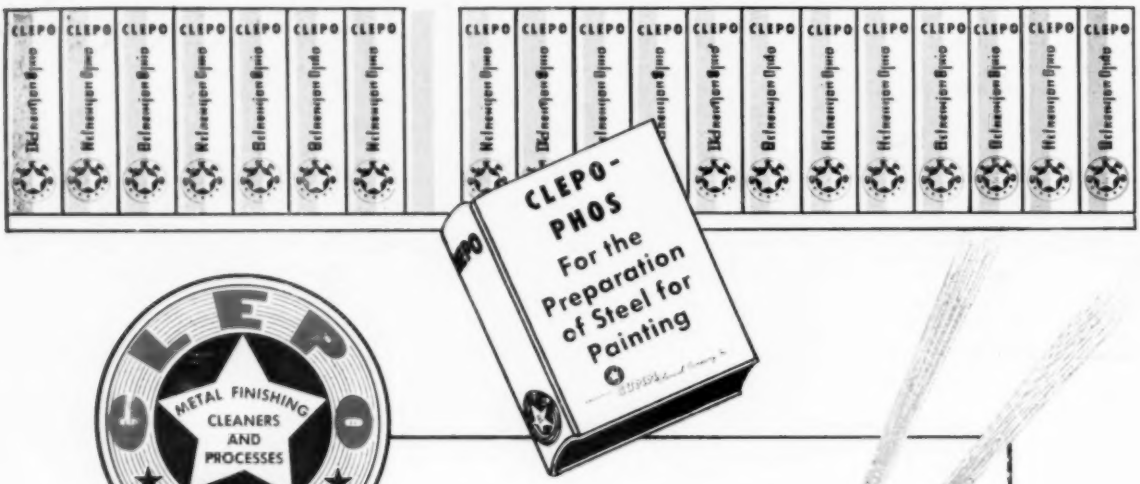

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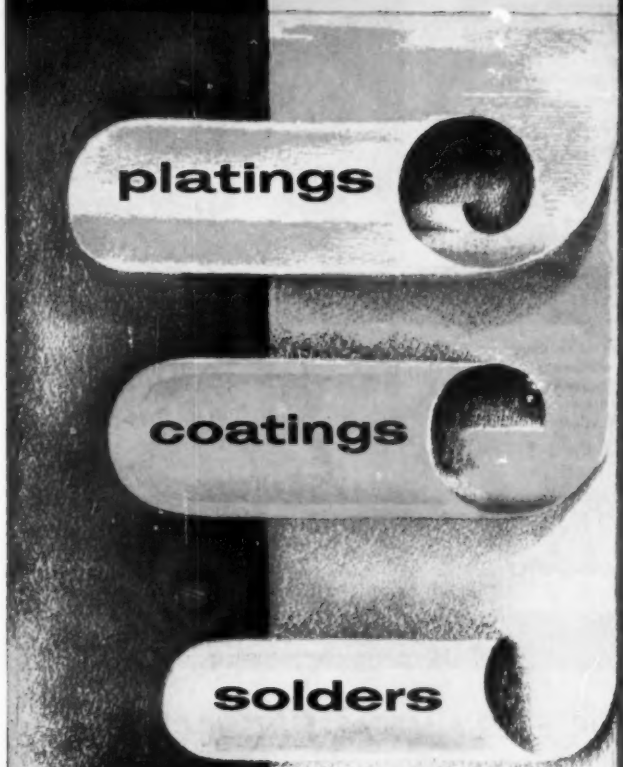

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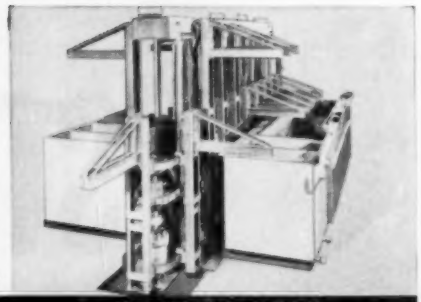

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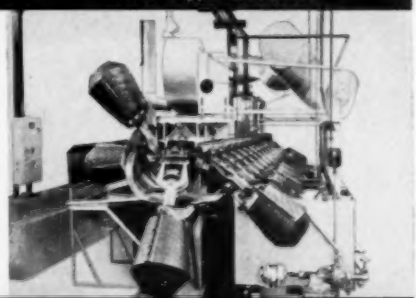

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Journal of the American Electroplaters' Society

January 1956 **Vol. 43, No. 1**

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EDITORIAL

FOCUSING AND PINPOINTING

Few are the industries which are more heterogeneous than those concerned with the finishing of metals and electroplating. These range across the entire spectrum of fabrication and manufacture. They have a hand in every creation of man—since everything manufactured must be finished.

Since this is true there is bound to be an element of over-extension in our literature and interests. This factor sometimes leads to a situation wherein subjects overlap.

There has been felt a need to stop, occasionally, and look about: redefine our goals and routes; take stock of our ways and means; evaluate our knowledge; and clarify the atmosphere about us. This has led to the publication, from time to time, of "feature issues" of PLATING. In these we try to pull together all the strings of one special subject, one particular segment of our industry.

In this issue we pay special attention to the problems and the knowledge of abrasives and mechanical finishing methods. The authors are competent men who are leaders in their field. The advertisers are organizations which take advantage of the opportunity to impart knowledge recently gathered about their products, goods and services.

In this issue we believe that we shall all be helped to refocus our understanding of one part of the immense field we must master to progress. We know that you will gain much through this pinpointing. We hope that the AES which represents and is, indeed, made up of so many men with so many interests will have served you more and better because of this effort.

Clyde Kelly

President, AES

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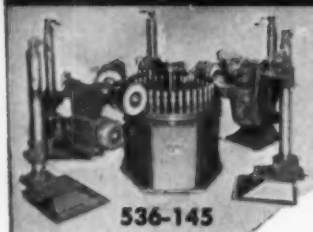

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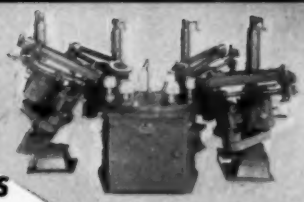

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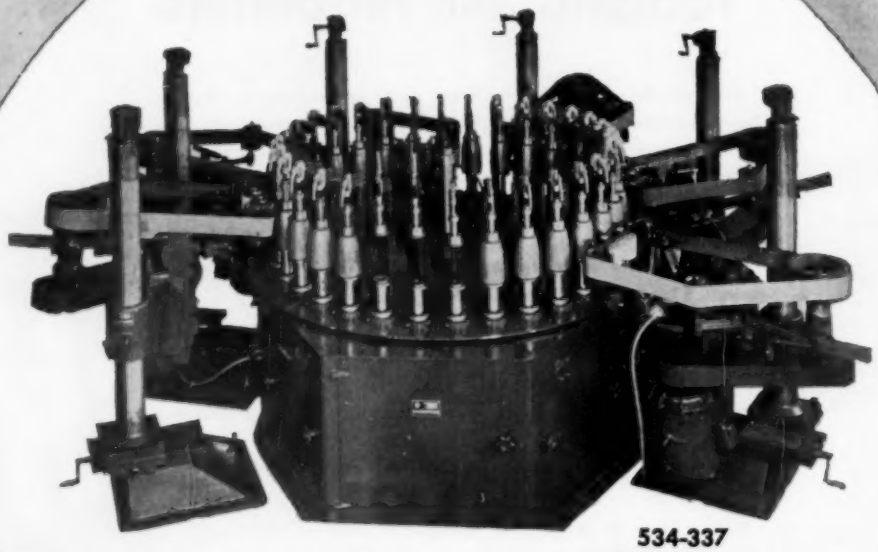

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INDUSTRY NEWS

Dr. Lee de Forest presents keys of the 1956 Ford, first prize in International Rectifier Corporation Selenium Diode Contest to the winner, Harry J. Kayner. Looking on are J. T. Cataldo (R) Assistant General Manager and F. W. Parrish (L) the company's Chief Design Engineer

A Prize—Harry J. Kayner, senior research engineer at the Advance Plant of North American Aviation, was awarded a 1956 Mainliner Ford at a special luncheon held in his honor at the Hotel Statler, Los Angeles, on November 10. Kayner was the first prize winner in International Rectifier Corporation's Selenium Diode Contest—a nation-wide contest calling for new applications for Selenium Diodes. Presenting the award to Kayner was Dr. Lee De Forest, famous "Father of Radio" and head of a distinguished panel of judges which included J. T. Cataldo, assistant general manager of International Rectifier, and the company's chief desing engineer, F. W. Parrish.

Quarter Century Club—At the Fifth Annual Banquet of the Quarter Century Club of the Pangborn Corporation, Hagerstown, Md., seven new members were welcomed by Thomas W. Pangborn, president.

With the seven new members, the Quarter Century Club's membership reaches 113 or 12 per cent of a total employment of 900 persons. Each new member of the Club receives an inscribed gold watch at the banquet.

Many sales members of the club journeyed considerable distances to attend the banquet, coming from as far away as the Pacific coast, St. Louis, and Chicago.

PANGBORN QUARTER CENTURY CLUB RECEIVED SEVEN NEW MEMBERS—From left to right the seven new members joining the Pangborn Quarter Century Club are James L. Keeney, Maxwell F. Poe, Guy M. Elliott, James S. Grove, William A. Byers, Everett C. Gilmour and Louis Hasenbuhler. At the head table stand Lloyd L. Stouffer, P. J. Potter, Thomas W. Pangborn, Victor F. Stine, John C. Pangborn, Helen R. Fisher (Directors of the Corporation) and the Reverend Walter B. McKinley

Plant Maintenance Show—Five thousand different pieces of equipment, products and services, valued at $4,000,000, to help American industry maintain its productive capacity, will go on display January 23, when the four-day Plant Maintenance & Engineering Show opens at Convention Hall, Philadelphia.

The show will be accompanied by a three-day conference at which 26 aspects of factory upkeep will be discussed.

More than 20,000 executives and engineers are expected at the show, one of the five largest annual expositions in the country, and 2,500 at the conference, which is the largest meeting of its kind.

The show, which is returning to the East for the first time since 1952, will have more than 400 exhibiting companies. The exhibit area will cover 100,000 square feet, about 10 per cent larger than the last show held in Chicago, and 60 per cent larger than the last Philadelphia show. Exhibits will cover 278 basic types of equipment, products and services.

Free Course in Electroplating—The course of study in Electroplating given at the Fort Greene Evening High School, 29 Fort Greene Place, Brooklyn, New York, (formerly Brooklyn Evening Technical High School) will begin its spring term on February 1, 1956.

The session is divided into classroom discussion and laboratory experiments. The classroom topics will include simple calculations, reading graphs, chemistry of the plating tank, pH, wetting agents, pitting, deionizing. The laboratory experiments will include tank analysis, Hull cell studies, anodizing.

Registration begins January 25, and daily thereafter from 7:00 to 9:00 P.M. Classes will meet on Tuesdays and Thursdays from 6:45 to 8:15 P.M. including about six Fridays. The term begins February 1 and ends June 30, 1956. Register with L. Serota in Room BW17 or 3E10.

INDUSTRY NEWS BRIEFS

● The 1500th American Standard has been approved, Vice Admiral George F. Hussey, Jr., USN (ret), managing director of the **American Standards Association** disclosed at the recent 37th annual meeting of the Association. This is double the number of American Standards in national use in 1948. Many of the standards in the 1500 had been revised, some several times.

● A new offering of 133,100 shares of common stock to finance the rapid expansion of the **Chromalloy Corporation** (White Plains, N. Y.) has been announced by Richard P. Seelig, executive vice-president. It is being underwritten by S. D. Fuller & Co. of New York.

● **Lithium Corporation of America, Inc.** to expand its electrolytic plant at St. Louis Park, Minneapolis, Minn. H. W. Rogers, pres., announces the company's present contractual requirements for the supply of lithium metal and lithium hydride in 1956 has made necessary the immediate expansion of the Metal Division to meet the demand.

● The merger of **Consolidated Chemical Industries** into **Stauffer Chemical Company** was approved by stockholders of both companies at special meetings held in San Francisco, Cal.

● An on the spot survey of French and English industry will be made by E. J. Funk, v.-p. and chief eng. of **C. M. Kemp Manufacturing Co.,** Baltimore, to pin point the increasing need for highly developed automatic air and gas drying equipment and inert gas generators.

● **Pennsylvania Salt Manufacturing Company** has announced plans to enter the aerosol propellant and refrigerant fields late in 1956 with the Isotron line . . . a complete family of chlorofluorohydrocarbons.

● In New York the **Coliseum Exhibition Corporation** has leased the New York Coliseum from **Triborough Bridge and Tunnel Authority** for 10 years at a minimum guarantee of $300,000 a year plus a graduated percentage of gross income.

● Appointment of eight additional manufacturer's representatives to provide coast-to-coast sales coverage for RCA electronic metal detection equipment has been announced by Ralph A. Teare, manager, **Industrial Products, RCA.**

● Completion of a move to its new plant on East 289th Street in Wickliffe, Ohio, has been announced by Roger Tewksbury, president of **The Oster Manufacturing Company,** manufacturers of pipe and bolt threading machinery and material handling equipment. The plant has a total area of 105,000 sq. ft.

● Plans for a $506,000 addition to its factory at Adrian, Michigan have been announced by E. J. Williams, vice-president, operations of the **American Chain & Cable Company, Inc.**

● An all out effort on the part of the domestic tungsten mining industry to develop the full usefulness of tungsten in high temperature alloys is made known by W. Lunsford Long, president of **The Tungsten Institute.**

The Best in Barrel Nickel Plating

●

Barrel Nickel Plating has grown up in the last 20 years. Most of the handbooks and other literature on plating still give the old formulas for barrel nickel solutions which have been superseded in the last ten years by the modern high speed solution pioneered by True Brite. Several papers on barrel nickel plating have been given which describe these solutions and their use, which are published in the Annual Proceedings of the American Electroplaters' Society.

●

Most of the barrel nickel plating today is done using this type of solution. Full details on these are given in the articles mentioned and in our technical bulletin on barrel nickel plating.

●

Impurities in barrel nickel plating solutions are not often mentioned but are extremely important. The methods of ridding the solution of impurities are the same as those used for bright nickel solutions in general. Carbon treatment is not too important as no wetting agents are used in barrel solutions and buffing dirts are seldom encountered. Dummy plating at about ¾ of a volt is the best way of ridding the solution of copper and zinc which cause the majority of the trouble. The source of these impurities may be from recessed work but most often is caused by impure salts used in making additions. Nickel chloride is especially impure and large additions almost always cause trouble. True Brite recommends the use of magnesium chloride to supply the chloride content. This salt is available in a pure form at reasonable price and dissolves readily.

●

True Brite Chemical Products Co. has a complete line of brighteners for barrel nickel plating which enable trouble free bright plating of the highest quality. Our wide experience with barrel nickel plating enables us to give our customers the information they need without delay. Send for our technical bulletin on barrel nickel plating or let us help you with answers to your problems in barrel nickel plating.

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INDUSTRY NEWS

Expansion Story—The opening of a new Coating Division of Michigan Chrome and Chemical Company is announced by its president Robert J. Huber. The new Coating Plant is located at 275 Iron Street, Detroit 7, Mich.

Huber

Jones

Frank Jones has been appointed manager of the Coating Division. Jones, formerly assistant sales manager of the Chemical Division, will supervise all activities of the new Coating Division.

Facilities of the Coating Division for the application of Miccrosol (vinyl plastisol) to such items as tanks, hoods, etc. are more extensive than anywhere else in the country. The Coating Division Plant is 12,000 square feet in area. A large new convection oven can handle the largest industrial equipment and smaller ovens are available for additional production. Smaller parts, such as baskets, automotive accessories, etc. are conveyorized and processed in a tunnel-type oven.

Materials handling equipment is coated to protect finished parts. Plating racks for the electroplating industry are insulated with Miccrosol. Tanks for holding corrosive acids and caustics, and ducts and hoods for fume exhaust systems are coated to prevent chemical attack.

The new chemical laboratory of Michigan Chrome and Chemical Company, equipped and staffed for research and development in plastisols for industry, works with the Coating Division in providing the proper coating and application technique for each particular job. The Coating Division thus serves as a source of assistance and information in solving new coating problems for many Miccrosol applicators all over the country.

The Coating Division of Michigan Chrome and Chemical Company has the largest dip tank in the country, for this type of application. The plant is also equipped for spraying which is a new development in the application of Miccrosol coatings.

Michigan Chrome and Chemical Company headquarters and main office are located at 8615 Grinnell St., Detroit 13.

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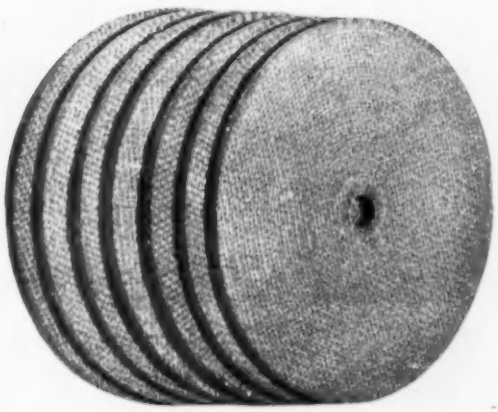

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INDUSTRY NEWS

Expands Facilities—E. H. Titchener and Company, manufacturers of welded wire assemblies, have announced the latest additions to their plant facilities in Binghamton, N. Y. Major expansion made in Titchener's plating and finishing department will also extend the design services offered by the company's complete sample-making laboratory.

Newest installations include an electropolishing process for finishing stainless steel wire forms and assemblies; also strip metal parts; and a plastisol dip operation for black or white coating of wire assemblies such as furniture chair backs, hospital equipment, leather working racks, and holding devices for glass and ceramics.

New "Product Information" Department—A new Product Information Department has been established by International Rectifier Corporation, El Segundo, Calif. Headed by Fred Genge, the new department will expedite the dissemination of information about all International products.

New product releases and editorial feature material will emanate from the new department and, in the case of news releases, special effort will be made to submit information of direct interest to specific audiences.

As a further service to trade publications, the technical writing abilities of International's engineering staff will be made available through the Product Information Department. This well-qualified staff will gladly assist in the preparation of editorial features pertinent to the industry.

S. S. Brenner peering at Whiskers

Metals are Imperfect—Super-strong perfect crystals of a wide variety of metals can be made by the same process General Electric scientists discovered several years ago to make the first perfect crystals of iron.

Strengths up to 120 times normal have been observed in the perfect crystals, Dr. C. G. Suits, GE vice-president and director of research, said.

Perfect crystals of gold, silver, platinum, copper, nickel and cobalt have been grown by Sidney S. Brenner in the process, which uses a high concentration of metal in the form of gas, obtained either by chemical means or by boiling the metal.

GE scientists point out that metals are ordinarily from 10 to 1000 times weaker than they theoretically should be, due to imperfections in the crystals which constitute their basic structure. In perfect crystals such imperfections are almost eliminated, and metals achieve strengths approaching those indicated by theory.

Recent GE research on copper has shown that its perfect crystals can withstand tensile stress as high as 600,000 pounds per square inch. In contrast, samples of ordinary annealed copper, composed of more than one crystal, break at 30,000 psi, and single imperfect crystals break at only 5,000 psi.

Another characteristic of the crystal whiskers is their ability to "remember" their original shape. When stressed beyond a certain point, a whisker will remain bent, but if it is then heated it will return to shape. A deformed whisker of copper, for example, when heated 40 minutes to over 1000° Centigrade shows this recovery characteristic, as remarkable a performance as if a crumpled automobile fender were to spring back into shape after merely being heated.

New Product—The Chemical Corporation of Springfield, Mass. has announced the addition of Luster-On M to its line. Luster-On M is a new, quick one-dip brightening treatment for zinc. Used in very dilute 2 per cent solution to give a bright, attractive finish with good corrosion protection.

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Heating your acid tanks with Clepco Electric Immersion Heaters is the most modern and now the most proven of all methods known today.

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Clepco Steel and Stainless Immersion Heaters are designed to meet the specific demands of the Alkaline Bath heating problems of the Industry.

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INDUSTRY NEWS

LOUIS M. TIMBLIN

Louis McFarland Timblin, treasurer and a director of Chas. Pfizer & Co., Inc., died on Nov. 21 at the Mather Memorial Hospital following a heart attack. He was 56 years old.

Timblin joined the Brooklyn drug and chemical concern in 1940 as auditor and subsequently became assistant treasurer. He was appointed treasurer in 1945. Prior to his association with Pfizer, he had been with F. W. Lafrentz & Co., certified public accountants.

A member of the executive committee of the Pfizer Board of Directors, Timblin was also chairman of the Company's Grants Committee and treasurer of the Pfizer Foundation. He was a director of the Lafayette National Bank of Brooklyn and of the Brooklyn Borough Gas Company.

Bart Labs Expand—The completion of a new plant to house the precision precious metals plating facilities of Bart Laboratories Co., Inc., Belleville, N. J., has been announced by Ray N. Griffin, vice-president.

Now encompassing approximately 19,000 square feet of floor space, the new plant is located in adjacent North Newark, bounded by two railroads, easily accessible to major highways and the firm's sales-executive offices in Belleville.

AES SUSTAINING MEMBERSHIP PROGRAM

Eight more progressive firms have joined the AES Research effort through the important medium of the Sustaining Membership program. The new firms are:

Firm and City	Branch Credit
Acid Products Co., Inc. Chicago, Ill.	Chicago
Alloycraft, Ltd., Westmount, Montreal, Canada	Montreal
General Plating Co. Trenton, N. J.	Philadelphia
Harlan Electric Co. Detroit, Mich.	Detroit
Lorence Plating Co. Cleveland, Ohio	Cleveland
Progress Mfg. Co., Inc. Philadelphia, Pa.	Philadelphia
Standard Plating Works, Inc. Goshen, Ind.	St. Joseph Valley
Victor Casket Hardware Co. Galesburg, Ill.	Mississippi Valley

Number of Sustaining Members supporting AES Research through this month.. 325*

Number of Sustaining Members supporting AES Research through last month.. 318

* This represents a net gain.

Company Changes—Graham, Crowley and Associates, Inc., Consulting Electrochemists and Engineers, report a number of changes according to an announcement by Dr. A. Kenneth Graham, president.

The company's general offices and Chicago research laboratory has moved into improved quarters at 5465 W. Division Street, Chicago 51, Ill.

A new branch office was opened on October 1, at the site of the company's pilot plant, 2152 Portage St., Kalamazoo, Mich. in order to better serve industry in the Michigan area with respect to electroplating, industrial waste treatment, and engineering matters. Frank K. Savage, vice-president, has been appointed manager.

John L. Stephens has joined the company's laboratory staff at Jenkintown, Pa. Stephens was formerly employed by the Cannon Electric Company, Los Angeles, Cal., in their electroplating department.

Officers Elected—At the annual meeting of the Board of Directors of Magnuson Products Corporation on Nov. 3, the following officers were elected for the ensuing year: president, Ingrid C. Magnuson; executive vice-president, and secretary, Russell F. Burch; treasurer, Charles L. Novak; asst. secretary, William F. Nickerson; asst. secretary, Edward Magnuson, Jr.

The Corporation, founded by the late Edward Magnuson, is commencing its thirty-third year of continuous operation in the cleaning compound field.

ATLANTIC GREASELESS COMPOUNDS *are unexcelled*

for fast, clean-working

POLISHING & BUFFING OPERATIONS

in the finishing of

METALS, PLASTICS, & WOOD.

Economy-pak foil lined, fibreboard container

ATLANTIC GREASELESS COMPOUNDS are produced by specialists with a background of long experience in the compounding and application of greaseless finishing materials.

The rigidly controlled uniformity of ATLANTIC COMPOUNDS helps you maintain your high finishing standards. This dependable uniformity is assured by the highest grade ingredients and by extremely close quality control in manufacturing.

Devoted exclusively to producing unexcelled greaseless compounds, Atlantic maintains constant research striving for continually improved products. Technical assistance and data available upon request.

Aluminum Tube

THE ATLANTIC COMPOUND CO.

1860 BALDWIN STREET WATERBURY, CONNECTICUT

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NEW DEVELOPMENTS
from
THE CHEMICAL CORPORATION
Research Laboratory

LUSTER-ON® OLIVE DRAB N. D.

A dark, hard, stable olive drab coating. Applied in about 15 seconds at room temperature. Gives maximum corrosion protection. Meets most rigid specifications. Available in one package.

LUSTER-ON D

A powdered product to produce a bright clear conversion coating on zinc and cadmium.

LUSTER-ON ACTIVATOR

Designed for preparing a zinc alloy die casting prior to treatment in our Luster-On acid baths. Also serves as a mild cleaner. However, heavy soil must be handled by a precleaner.

LUSTER-ON NS

The answer to "spotting out" troubles on thin copper and brass plate, especially under humid conditions. Improves adhesion, provides leveling action, saves lacquer. Eliminates fingerprints before assembly.

LUSTER-ON ALUMINUM SEALER (222-M)

Produces a chromate film on aluminum that provides excellent corrosion protection and can serve as a paint base. Now can be dyed in many attractive pastel colors. Meets requirements of Government Spec. MIL-C-5541.

•

Ask for literature. Send a sample for free laboratory treatment.

Luster-On products are manufactured on the West Coast by Crown Chemical and Engineering Company of Los Angeles, Calif., and in the Dominion of Canada by Alloycraft Limited of Montreal, Quebec.

You'll also be interested in our SafetyDivision's line of industrial skin cleaners and protectors . . . protect your workers and your products. Literature available.

L-18

THE Chemical CORPORATION
57 WALTHAM AVENUE
SPRINGFIELD, MASS.

240 YEARS' CHEMICAL MANUFACTURING EXPERIENCE PERSONIFIED
Seven-way handshake of congratulations is happily exchanged and shared by (left) John A. Sargent, president of Diamond Alkali Company, and six 40-year employees of its Painesville (Ohio) Works. Appearing clockwise are: Nicholas Zavore, F. C. Quick, John Braski, S. L. Andrews, Camillo Evangelista, and Hugo Torre

Employees Cited for 6,425 Man-Years—With individual records ranging from one to four decades, 353 employees of Diamond Alkali Company's Painesville (Ohio) Works were cited for their long service.

The company awarded diamond-shaped pins to these 353 men and women, whose combined service with Diamond totals 6,425 man-years—a record compiled in less than half a century.

The group honored at the annual service award citation banquet this year marked the largest number of Diamond employees at Painesville ever to be cited at one time in the company's 45-year history. Diamond's Painesville Works, the company's oldest and largest facility, is also the world's largest plant of its kind.

Educational Program—A broad program of technical assistance through product information and consultation to provide industry with topical, cost-saving advice on modern systems for cleaning metal parts has been announced by Circo Equipment Company, Rahway, N. J.

This program, which will be administered for Circo by The George Black Company, public relations counsel, Union, N. J., is based on the recognition that faster and more effective metal cleaning techniques are becoming the urgent concern of production engineers as increased automation of plating and assembly lines demand the utmost performance from degreasing equipment.

Scale-Removal Service—Using chemicals to remove scale deposits from industrial equipment is a service provided by a newly organized company, Chagrin Chemicals, Inc., with offices and laboratories located at 42 S. Main Street, Chagrin Falls, Ohio. Operating in a market area extending 200 miles around Cleveland, the new organization will specialize in the removal of scale from boilers, surface condensers, pipe lines, chemical process equipment and steel mill equipment.

Haecker

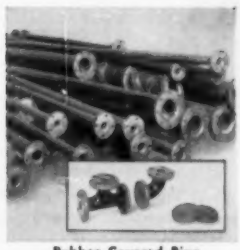
The Chagrin Chemicals service is said to reduce down time for cleaning heavy equipment to a fraction of the time required by hand cleaning and other methods. Certain types of equipment can be cleaned while in service.

The firm's president is Charles G. Haecker, formerly with Dowell, Inc., Medina, Ohio and Solvent Service Inc., Painesville, Ohio. Haecker's previous experience includes sales management, sales service, market analysis and technical paper writing. He is a graduate of Western Reserve University and studied chemical engineering at Fenn College.

● To electroplaters and plating department heads in every section of the nation, the name ARco is symbolic of broad engineering knowledge . . . advanced methods and equipment . . . bringing top plating results.

Corrosion-resistant ARco rubber coverings are applied to tanks and accessories, Diaphragm Systems, Parts Separators, Air Agitation Systems, Grids and Screens, Ventilation Equipment, Pipes and Fittings, Materials Handling Equipment. For expert advice on economical, efficient rubber applications to electroplating equipment, call on ARco engineers. Their help is offered to you without obligation.

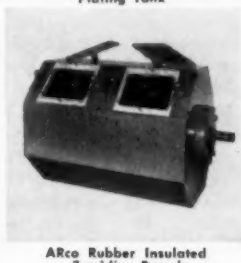
Sheet Rubber Lined Plating Tank—Open Type



Rubber Covered Pipe and Fittings

Rubber Lined Diaphragm Plating Tank

ARco Rubber Lined "Handy-Tanks"



ARco Rubber Insulated Tumbling Barrel

Seamless Rubber Insulated Handling Equipment

ARco Materials, Equipment, Engineering and Service . . . Vital To Better Electroplating

. . . assure improved plating quality and production!

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PERSONALS

The promotion of **William H. Gilman** to the post of general employee relations manager of Brush Electronics Company, Cleveland, has been announced by **B. H. Van Houten,** vice-president for employee relations.

Gelman

Harris

Also announced was the appointment of **John H. Harris** as vice-president in charge of planning and **Wallace T. Gray** as general works manager by **Douglas C. Lynch,** president of the Brush Electronics Company, Cleveland.

Harris has been vice-president and general works manager for the firm, a division of Clevite Corporation, since 1948. In that post, he directed manufacturing, production control, maintenance and inspection.

Gray was formerly works manager for the Leece-Neville Company.

Earl M. Douglas, prominently identified with the automotive industry since its earlier days, has been named vice-president of Dana Corporation with responsibility over technical activities relating to product engineering.

Douglas

Risko

The appointment of **Henry Risko** as sales manager of the Industrial Filtration Division, has been announced by the U. S. Hoffman Machinery Corp., New York.

Risko joined U. S. Hoffman in 1942 as a service engineer in the Industrial Filtration Division, and in 1952, was appointed division service manager. In his new capacity, Risko will be in charge of sales for the Filtration Division, which manufactures flotation units, precoat type pressure filters, disc filters, magnetic separators, petroleum solvent stills, suction filters, and other specialized equipment.

It has been announced by the American Chain & Cable Company, Inc., Bridgeport, Conn., that **George W. Herman** was recently appointed to the position of assistant plant manager of the Bridgeport plant. Manufacturing facilities for the Campbell Machine Division, Helicoid Gage Division, Owen Silent Spring Division and the Wilson Mechanical Instrument Division are maintained at Bridgeport.

Herman

Coleman

The appointment of **Harold J. Coleman** as sales manager of Chandeysson Electric Company has been announced by **James F. Carland,** executive vice-president. Before joining Chandeysson, Coleman was associated with the General Electric Company. More recently, however, he was a district manager for Essex Wire Corporation.

In his new position, Harold Coleman will directly supervise sales and sales planning for Chandeysson Motor Generators to the metalworking, graphic arts, aircraft and other industries.

John M. Wermuth has been named assistant to **John C. Sprague,** treasurer of Acheson Industries, Inc., Port Huron, Mich. Wermuth's business experience includes three years with Warner-Hudnut, Inc., New York, where he was assistant to the secretary.

Wermuth

Pettigrew

The appointment of **David W. Pettigrew** as administrative assistant to the American Zinc Institute, Inc. has been announced by **Ernest V. Gent,** executive vice-president. Pettigrew was formerly a sales engineer for Swindell-Dressler, Inc. a Pittsburgh engineering firm.

Robert James Amis has been appointed as a metal finishing sales engineer for Frederic B. Stevens, Inc., by **Frank Watt,** Stevens' general sales manager. He will cover the territory of the eastern section of Detroit and eastern Michigan as far north as Port Huron. Prior to his being named sales engineer, Amis had served at Stevens in the capacity of chief Draftsman and service engineer in the Metal Finishing Division.

Amis is at present a member of the Detroit branch, AES.

Amis

Duncan

Appointment of **Donald C. Duncan** as general manager of the Berkeley Division of Beckman Instruments, Inc., has been announced by corporation president, **Dr. Arnold O. Beckman.**

At the same time, Dr. Beckman announced the appointment of **Thomas Allinson** as manager of the Berkeley Division, located in Richmond, Calif. Allinson will report to Duncan who will continue to serve as general manager of Beckman's Helipot and Arga divisions in South Pasadena.

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Northwest Chemical quality is equal to any in the field. Their formulas are based on careful research and long experience. The steady growth of the company and the acceptance of their products is due to the invisible ingredients compounded in each shipment going into a customer's plant.

Those ingredients which give Northwest Chemical customers a superior product are the careful, individual attention given each customer's requirements, expert analysis of the job to be done plus the technical ability and experience to produce basic formulas to exactly the point of top efficiency in each case and by constant stand-by service, to keep them that way.

That is the reason Northwest Chemicals are specified by an ever increasing number of the country's top manufacturers.

Remember—the cost per finished article is the true cost of your cleaner. Northwest's stand-by service keeps the job right.

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pioneers in pH cleaning control *serving you since '32*

PERSONALS

Bernard N. Cullen, sales & advertising manager of Adelphi Paint & Color Works, Inc. and its Baer Bros. Paint & Varnish Division, has just announced the selection of **Frank Harvath** as a new sales representative. Harvath will represent the Industrial Finishes Division of both companies and will call on Industrial accounts in the state of Ohio.

Kurt Albrecht, of Pittsburgh, Pa., has joined the Detergent Section of Diamond Alkali Company's Silicate, Detergent, Calcium Division as a research chemist, according to an announcement made at the Diamond Research Center by **John W. Mantz,** division manager.

The appointment of **S. S. Price** and **A. H. Adams** to two newly established engineering posts in the Distribution Assemblies Department of the General Electric Company has been announced by **R. C. Wilson,** manager-engineering for the Department.

Price has been appointed manager-panelboard and motor control design engineering. Adams has been made manager-switchboard and distribution center design engineering.

Edgar B. O'Hora has been appointed manager of air conditioning, refrigeration and internal sales, a newly created post, for General Electric's Small Integral Motor Department, Fort Wayne, Ind. The appointment was announced by Gordon T. Graham, manager of marketing.

Shellenberger

Donnelly

Kastner

Day

John O. J. Shellenberger, vice-president, has been appointed director of marketing of the American Chemical Paint Company, Ambler, Penna. The appointment was announced by **Leon Cherksey,** president.

In his new capacity, Shellenberger will supervise sales and marketing activities of the Ambler firm's three main divisions: Metalworking Chemicals, Agricultural Chemicals, and the International Division. He carries into this new position a background of 20 years' experience in metalworking and agricultural chemicals, both at home and abroad.

Frank K. Donnelly, noted Seattle engineer and business executive, has been named sales representative for Torit Manufacturing Co., St. Paul, Minn., in the Washington and Oregon trade area, according to the firm's president, **William West.**

MacDermid, Inc. Waterbury, Conn., suppliers of chemicals and equipment for the metal finishing industry, has announced that **George Kastner** has joined their staff. Kastner, formerly chief engineer of Vickers, Inc., will specialize in the promotion and servicing of all mechanical equipment handled by MacDermid, Inc. He will also be in charge of MacDermid's advertising, sales promotion and other details of a similar nature.

David H. Day recently joined the industrial sales staff of Wyandotte Chemicals Corporation. He will headquarter in Albany, N. Y. and will be attached to Wyandotte's Buffalo office. For the past 4 years, he has worked for GE at Schenectady. He is a member of the AES.

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the Perfect Combination

FROM START TO FINISH

ZIPPO CLOTH BUFFS

These famous long-wearing buffs run cool under all buffing conditions. High count bias-cut cloth is assembled on ventilated steel centers. Each section is perfectly balanced and faced—requires no raking.

BUFFING COMPOUNDS

Formax produces a complete line of buffing compounds in bar, tube and liquid form.

Our extensive manufacturing, laboratory and testing facilities are at your disposal.

ZIPPO SISAL BUFFS

You have a pleasant surprise coming if you haven't tried the new Zippo bias-type sisal buff. It was specifically developed for steel buffing—to blend polishing grit lines—to cut down stainless steel—and bring up a bright lustre.

Other Formax products include the well-known C-20 Flexible Contact Wheels and F-26 Abrasive Belt Grease Stick.

Descriptive Catalogs Sent on Request

FORMAX MFG. CORP.

DETROIT 7, MICHIGAN

"THE FOUR McALEERS"

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 114.

Wantz

Butts

Bergquist

Dondero

Appointment of **Clarence Wantz** as chief engineer in charge of the engineering department of Robertshaw Thermostat Division of Robertshaw-Fulton Controls Company has been announced.

Wantz developed the first practical timer controls for top burners of gas ranges which were introduced last year. The automatic shut-off controls, utilizing an elementary principle of physics, represented the solution to a problem that perplexed the gas industry for 25 years.

He became associated with the Robertshaw-Fultor organization in 1952.

W. N. Murton, vice-president of International Rustproof Corporation announces the appointment of **H. H. Butts** as sales engineer for the Chicago area.

Metalwash Machinery Corporation, of Elizabeth, N. J., manufacturers of metal parts processing machinery, announces the appointment of **Kenneth H. Bergquist** to represent the Company in Northern Illinois and Southern Wisconsin.

With Metalwash in the engineering department since 1947, Bergquist was originally employed by the National Lock Company as plating Chemist.

The Metalwash Chicago Office, now under the direction of Bergquist, has been relocated to Barrington, Illinois.

Louis E. Dondero has been named manager of the Cleveland Rock Drill plant of the Le Roi Division, Westinghouse Air Brake Co. He succeeds **Russell R. Morgan,** who recently retired. Dondero's appointment was announced by **Paul I. Birchard,** Westinghouse vice-president and general manager of the Le Roi Division. Dondero, joined Le Roi in 1946 as assistant service manager.

Lee H. Clark, general manager of the Pennsylvania Salt Manufacturing Company's Sharples Chemicals Division, has been named vice-president of the parent company, president **William P. Drake** has announced. While the scope of Clark's new office was not disclosed, it is understood that his major duties will be concerned with corporate organization and planning functions.

The election of **D. Frank Mederos** as vice-president and assistant to the president of the Walworth Company, nationwide manufacturers of valves and pipe fittings has been announced by **Fred W. Belz,** president. In addition to his new duties, Mederos will continue to have charge of all sales of Walworth products in Canada. The company's Eastern Division and Boston Branch sales also will continue under his direction.

Heizmann

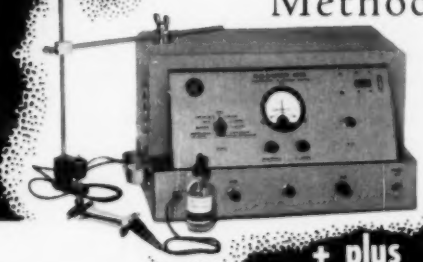
John R. Heizmann has been appointed as metal finishing sales engineer covering sections of the Detroit area for Frederic B. Stevens, Inc., Detroit, Mich.

For the past five years he has owned and operated his own electroplating job shop in Reading, Pa. which gives him an insight concerning the problems of local job shop operators.

Prior to 1951, Heizmann was employed for 12 years as an industrial engineer and member of the executive committee by the Penn Hardware Co., Reading, Pa. His experience with the latter firm included several years as supervisor of metal finishing operations.

Check plating thickness
WITH THE
KOCOUR ELECTRONIC THICKNESS TESTER*

*Anodic Solution Method



6 Simple steps . . . to quick, accurate results

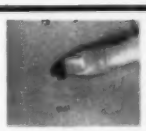
1. MOUNT THE CELL . . . on the spot to be tested and clip lead wire to specimen.

2. ADD TEST SOLUTION . . . which corresponds to the type of plating and base metal tested.

3. PLACE STIRRER IN POSITION.

4. SET SELECTOR SWITCH to the type of plating to be tested as indicated on panel.

5. PRESS THE TEST BUTTON to start the test . . . and upon completion the unit shuts off automatically.



6. TAKE THE READING directly from the counter on panel i.e., 0.0004".

TOTAL TIME . . . less than 2 minutes

+ plus these features

- DETERMINE THICKNESS OF
  decorative chromium
  heavy chromium
  silver, copper
  tin, brass
  cadmium, nickel
  zinc, lead
  lead-tin alloy
  tin zinc alloy
  on various base metals and materials.
- WIDE THICKNESS RANGE
- DIRECT READINGS
- 90-95% ACCURACY
- TESTS ARE RAPID
- VIRTUALLY AUTOMATIC
- ELIMINATES HUMAN ELEMENT

Don't delay! See how the Electronic Thickness Tester can solve your problem. Write for literature today.

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Pioneers in Control for the Plating Industry

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Chicago 32, Illinois

L—100. Transmitter for Closed Tank Level Measurement—The Foxboro Company issued a new 8-page bulletin, 13–22, describing closed tank liquid level measurement and control with the recently announced Type 13 LA d/p Cell Liquid Level Transmitter.

The Type 13 LA is essentially the same as the familiar force balance differential pressure flow transmitter, except that a simple range suppressor spring has been added to the basic mechanism. The spring balances out the effect of hydrostatic pressure in the piping line from the high point of the tank. Transmitter is fully adjustable for measurements up to the equivalent of 250 in of water without change of parts.

L—101. V-8 Engine Bulletin—A new 8-page bulletin describing Le Roi's industrial H540 and H844 V-8 engines has been published by the Le Roi Division of Westinghouse Air Brake Company. Le Roi manufactures high-output internal combustion engines, Tractairs, portable air compressors, stationary air compressors and air tools.

V-8 Engines

The 3-color bulletin uses 40 halftones, charts, drawings, and diagrams to illustrate the advance design, performance, and economy of these two engines, which operate on gasoline, natural gas, or LP gas.

L—102. Newsletter—The City Plating Works of Bridgeport, issues a newsletter which frequently concerns itself with practical finishing problems. Vol. 4, No. 4 is entitled "Liquid Honing or Vapor Blasting."

L—103. Phosphating Materials and Process—A guide for personnel engaged in the application of protective phosphate coatings on ferrous metals, prepared by Rock Island Arsenal Laboratory, has been released to industry through the Office of Technical Services, U. S. Department of Commerce.

The report describes the mechanical equipment and its installation, cleaning operations, processing solutions and procedures, and the chemical control methods required for the application of these protective black finishes to ordnance materials. 88 pages. Price $2.25.

L—104. Table-Type Blast Cleaning—A new bulletin describing one of its table-type airless blast cleaning machines has been published by Wheelabrator Corporation, Mishawaka, Ind. It is devoted to the Wheelabrator Plain Table, a machine particularly designed for handling a wide range of work, like that found in job shops.

It is intended for cleaning work which does not have too many pockets or vertical edges. Such work includes castings, forgings, heat treated parts, weldments, or stampings. Other applications include cleaning work in connection with reconditioning, like gas and water meters and automotive parts. Still others are the preparation of metallic parts for galvanizing, rubberizing, glass coating, painting, enameling and plasticizing. Metallic parts can be peened in it to increase their fatigue life. The machine is ideal for flat or fragile work which requires careful handling.

Installation views, engineering drawings, and mechanical and electrical specifications are given for all of the different sized machines. A complete discussion of the airless abrasive blast cleaning process is also included.

L—105. Fancy Paints for Fine Finish—The versatility and wide application of Nubelite, a custom-formulated industrial paint finish for use on any metal product, is highlighted in a new, comprehensive brochure prepared and distributed by The Glidden Company of Cleveland, Ohio.

Profusely illustrated, the unique, 20-page brochure graphically displays a wide range of Nubelite-finished consumer products including: automatic washers and dryers, ironers, steel kitchen cabinets, water heaters, metal furniture, lighting fixtures, air conditioners, small appliances, metal desks, vacuum cleaners, and a host of other metal-made products for the home market.

Nice Furniture

L—106. Cabinets, Shelves, Drawers, etc.—A new and colorful catalog has been published by the General Industrial Co. Many new items have been added to General's standard line consisting of steel shelving, lockers, storage cabinets and inter communication systems. Offered in a wide variety of sizes and capacities, are the plastic drawer cabinets which are ideal for small tools, nails, etc. Each item is clearly illustrated and priced.

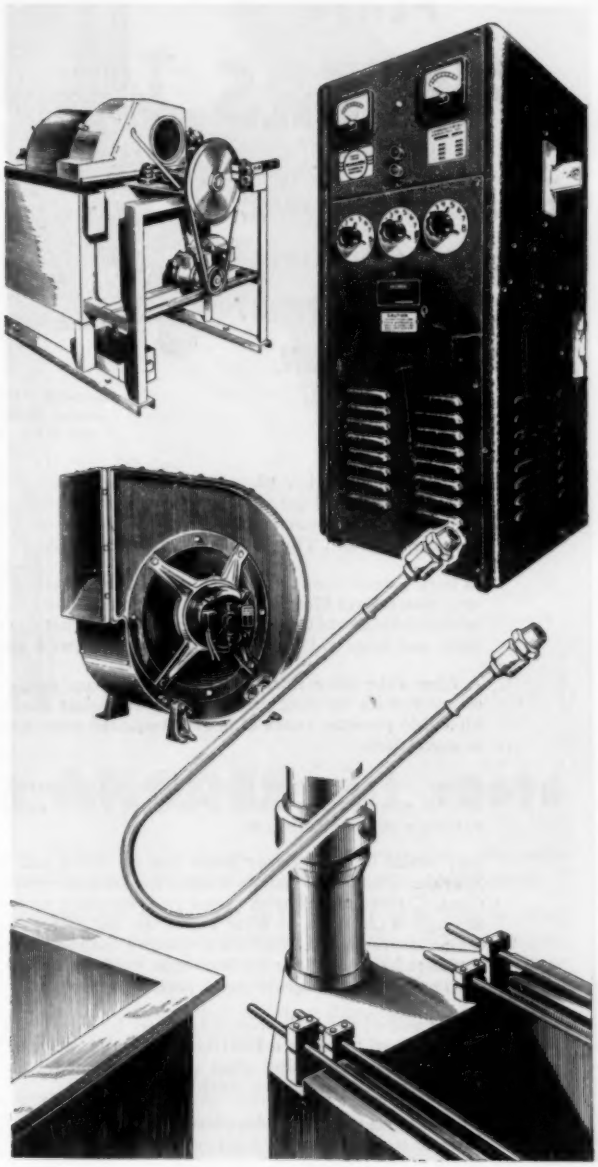
L—107. Technical Bulletin—Globe Compound Co. has published a revised technical bulletin. This brief catalogue lists and describes both bar and liquid abrasive compositions which have been tested and proven in industrial applications over many years. Particular attention is called to the stainless steel compounds for both cutting and coloring applications and R-41 Red Rouge for coloring nonferrous metals. Globe No. 11-A Tripoli is claimed to be the most satisfactory compound of its type for high speed and high temperatures automatic buffing operations.

L—108. On G-E Control Transformers—A new 32-page catalog describing the complete line of G-E control transformers is available from the General Electric Company, Schenectady, N. Y.

Including autotransformers, machine tool transformers, and special application models, the illustrated publication is designated GED-2767. It contains ratings, dimensions, product features, and model numbers. Also included are list prices, weights, and wiring diagrams. A special section shows panel and machine tool voltage regulation curves for use in selecting the proper transformer for given applications.

Designed to give you economy and efficiency in plating

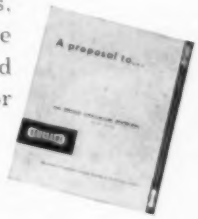
...a whole range of PLATING EQUIPMENT from UNITED CHROMIUM



Whether you need one new piece of equipment or a complete installation . . . here's good news for you. The Unichrome name can now be found on *equipment*, too.

That means plenty to platers who have known the kind of time- and money-savings which United Chromium's help makes possible. It means equipment that's right for the job . . . for longer service . . . and for substantial savings that go on year after year.

Ask us for a proposal. We'll be glad to survey your requirements in tanks, rectifiers, anodes, agitators, heating coils, temperature controllers, blowers, and all the other necessities for your operation.



UNICHROME

equipment • materials • processes

for better plating at a better profit

UNITED CHROMIUM DIVISION
METAL & THERMIT CORPORATION

100 East 42nd Street, New York 17, N. Y.
Detroit 20, Mich. • Waterbury 20, Conn.
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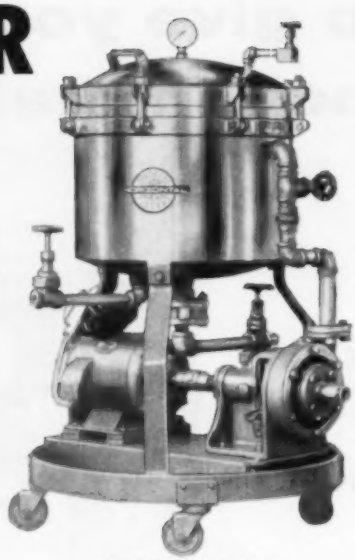
In Canada: Metal & Thermit—United Chromium of Canada, Limited, Toronto 1, Ont.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 116.

SPARKLER
HORIZONTAL PLATE
FILTERS

FOR LOW COST FILTERING
OF PLATING SOLUTIONS
AND CARBON TREATMENT
WITHOUT SHUT DOWN

HERE'S HOW



Sparkler Plating Filter
Model 18-D-6 Alliron
600 G.P.H. Portable

On a horizontal filter plate it is possible to apply a thin pre-coat with about one-third the filter aid, and in one-third the time required for pre-coating a non rigid media or a surface in a vertical position. This saves time and filter aid.

Where several tanks are to be filtered, the Sparkler filter can be shut down after filtering the first tank and moved to the next one without danger of disturbing the filter cake. This saves pre-coating time and filter aid usually required to re-coat a bag-type filter.

A filter cake on a horizontal plate will not crack, slip or fall off even with varying pressure or a complete shut-down of the filter. No pre-coat renewal is ever required after an interruption in operation.

When it is necessary to clean the filter, the Sparkler filter tank can be emptied in a matter of minutes with a minimum loss of valuable plating solution.

Any grade of filter paper from fine to coarse can be used in a Sparkler filter. This makes it ideal for carbon treatment of solutions. Carbon mixed with water in a stand-by tank is circulated through a clean set of filter paper on the plates until a carbon cake is formed. The solution requiring carbon treatment is then circulated through the carbon beds without contaminating the plating tank or a shutdown of plating operations.

At the end of the cycle with a Sparkler filter you can blow-down with air and produce a relatively dry cake that can be disposed of in a trash can rather than washing it down the drain with attendant sewer clogging problems.

You will find your Sparkler plating filter positive and dependable from a standpoint of uniform high quality filtering and economical in labor and material.

Write Mr. Eric Anderson for personal service.

Sparkler representatives in all principal cities are ready to give you personal service on your filtering problems, and show how you can make a material saving in operating cost.

SPARKLER

MANUFACTURING COMPANY
Mundelein, Illinois
SPARKLER INTERNATIONAL LTD.
Canadian Plant, Galt, Ontario
European Plant, Amsterdam, Holland

TRADE LITERATURE

L—109. Corrosion Resistant Plumbing—Released by Alpha Plastics Inc., West Orange, N. J., the first folder shows fully detailed reference information for proper selection of its unplasticized, rigid pvc pipe, where high chemical resistance and/or high impact resistance is desired.

Companion folder describes and illustrates threaded and socket solvent cement fittings recommended for use with the Alpha line of ½ in to 4 in, 101 and 102 rigid pvc pipe. Ordering information and other helpful data is provided. Readers are asked to request both folders for complete information. Folders available on request.

L—110. Ni Plated Steel—A twelve-page technical manual on CF&I Bart lectro-clad nickel-plated steel has been made available by The Colorado Fuel & Iron Corporation. The manual presents a technical description of CF&I lectro-clad nickel-plated products covering manufacturing techniques and fabrication procedures, including forming, welding, cleaning, handling and testing methods.

The Bart lectro-clad process deposits clear nickel on steel plate products in any thickness from .006 to .02 inches. The resultant nickel-plated steel can be shaped, fabricated, roll formed, dye formed, flame cut, sheared and welded without damage to the plating.

L—111. Data Sheets and Product List—Kawecki Chemical Company, manufacturers of chemicals, metals and alloys, has just issued technical data sheets on a number of its products. They are: Potassium Titanium Fluoride, Potassium Zirconium Fluoride, Potassium Fluoroborate, Titanium-Aluminum Master Alloy, Titanium-Boron-Aluminum Master Alloy, Boron-Aluminum Master Alloy, and Zirconium-Aluminum Master Alloy. The information includes chemical and physical properties, typical analyses and uses. Also available is a folder listing all the Kawecki products.

L—112. Abrasive Belt Grinding—"How Abrasive-Belt Grinding Increases Production," a new 31-page booklet consisting of 46 illustrated case histories, has been announced by the Engelberg Huller Company, Syracuse, N. Y., manufacturers of abrasive belt machines.

Application studies are grouped according to each of five types of abrasive belt machining—platen, contact wheel, formed wheel, centerless, and flexible belt, and cover a wide range of materials—ferrous and non-ferrous metals, glass, wood, and plastics.

Each abrasive belt grinding illustration is accompanied by a close-up shot of the ground parts.

TRADE LITERATURE

L—113. Coatings and Sheet Linings—The MW Protective Coatings Division of Metalweld, Inc. has issued a bulletin outlining the protective qualities of Neoprene in applications affected by sunlight, heat, abrasion, oil, cold and various chemicals. Included in the bulletin is a table on organic chemicals for which Neoprene lined tanks and piping can be recommended.

L—114. Producing and Processing Service—A special service to the metallurgical industries—the production and processing of made-to-order metals in experimental quantities—is described in a 16-page booklet just released by the Allied Products Division of Hamilton Watch Co. of Lancaster, Pa.

Entitled "Precision Metals Services," the heavily illustrated booklet describes the facilities of Hamilton's unique and complete pilot plant for producing small (10-pound) ingots by regular or vacuum melting, and for forging, annealing, heat treating, rolling and drawing the resultant metal. Highlights of this service which the booklet points out are: 1) Complete laboratory control for all steps in producing the metal; 2) Special facilities for rolling strip down to only .00025-inch thick; and 3) Special furnaces and processes for heat treating small parts to produce a bright surface and prevent distortion. The booklet also includes a list of other special metal producing and processing functions which the service will provide.

L—115. On Plating Waste Treatment—A new and highly informative technical article T-136 on plating waste treatment is now available from Graver Water Conditioning Co., New York, N. Y.

The article, entitled "Plating Waste Solutions—Recovery or Disposal," discusses the two possible methods of treating plating wastes by ion exchange or precipitation. The former method results in recovery of valuable materials from rinse solutions, while the precipitation method amounts to destruction of the materials.

L—116. Sn, Sb and Zr Derivatives—Metal & Thermit Corporation, New York, N. Y., is offering a new 6-page, 2-color bulletin, C197R, describing characteristics and uses of its extensive line of chemicals and other products derived from tin, antimony and zirconium.

Product groups described include inorganic and organic tin chemicals, organotin stabilizers, stannous soaps, antimony chemicals, zirconium products and various metals and alloys. Several newly introduced tin derivatives are grouped separately for ready identification under the heading "New Chemicals."

These ANODES cut costs

These are Federated's exclusive Conducta-Core anodes, the most economical lead anodes for modern chromium plating operations.

Conducta-Core anodes last up to three times as long as other lead anodes. The highly conductive and non-contaminating aluminum core rod runs the full length of the anode so they cannot warp or buckle. The Conducta-Core anode is designed with a greater number of high projections to give much improved throwing power and openings to provide self-cleaning action.

Let Federated serve as your single source for all plating materials. Copper, lead, zinc, tin, cadmium, brass and other non-ferrous anodes; high-quality full nickel content nickel salts; Zimax brighteners, in liquid and powder forms, for all types of zinc plating; Cadmax liquid brighteners for cadmium plating.

Think of Federated first when you need quality plating materials. Write directly to us for additional information on any of our plating products. Or get in touch with your nearest Federated Distributor.

Federated Metals

DIVISION OF AMERICAN SMELTING AND REFINING COMPANY
120 BROADWAY, NEW YORK 5, N. Y.
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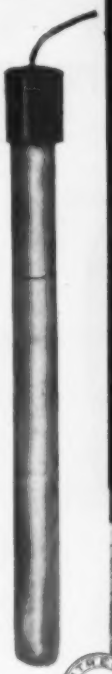
Federated first in the non-ferrous field AMSR

Aluminum, Anodes, Babbitts, Brass, Bronze, Die Casting Metals, Lead, Lead Products, Magnesium, Solders, Type Metals, Zinc Dust

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 118.



IF YOU USE IMMERSION HEATERS USE THE BEST

U.S. Patent No. 2,354,820

Compact, safe and efficient, *Vitreosil*® electric immersion heaters offer you your most dependable units. Designed for acid pickling and electroplating solutions and other acid baths, *Vitreosil* heaters give greater heat transfer per unit area and greater resistance to chemical attack.

Vitreosil immersion heaters are made of pure fused silica and have special corrosion-resistant caps, built-in ground wires for additional protection and easily visible minimum immersion depth markings.

Vitreosil immersion heaters will serve you best. Write for bulletin and prices.

THERMAL AMERICAN FUSED QUARTZ CO., INC.
18-20 Salem Street, Dover, New Jersey

Please send illustrated bulletin or information on _____

_____

Company _____

Name _____ Title _____

Street _____

City _____ Zone ____ State _____

TRADE LITERATURE

L—117. Buffing and Polishing Compounds—Characteristics and uses of over 100 buffing and polishing compounds are described and illustrated in a new bulletin offered by Hanson-Van Winkle-Munning Co., Matawan, N. J.

Listing H-VW-M's complete line of compounds, the 24-page two-color bulletin contains a full page chart which recommends cutting, coloring and double duty compounds to be used with twelve different metals, plastics and hard rubber.

Specific compounds are classified and described, with recommended usage, under the general headings of tripoli, cut and color compounds, steel and stainless steel buffing compounds, emery paste and cake, crocus, polishing lubricants, rouges, greaseless compounds and special buffing and polishing compounds.

L—118. Rotary Automatic Surface Grinders—Mattison Machine Works, Rockford, Ill. has announced publication of a new bulletin containing information about their No. 72 and 100 High-Production Rotary Automatic Surface Grinders.

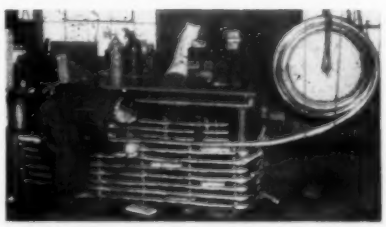
Designed specifically for machining flat surfaces on long run jobs in continuous, single pass operation, these grinders offer all the features of high horsepower and rugged construction for precision. The bulletin describes the various models available with as many as five wheel heads and tells how the use of automatic or manual fixtures, automatic handling devices, and automatic sizing make these machines versatile enough to handle nearly any job that will fit their standard work heights. Machines of special work heights can be produced.

A number of case histories are included to demonstrate the cost-cutting potentialities of this equipment.

L—119. Cleaning Problems—The application of specially designed airless blast equipment to 56 production cleaning problems, such as those encountered with cast, welded, forged, heat treated, and machined components used in automotive, railroad, ordnance, farm, and all sorts of other equipment and machinery is fully described in a new 34-page brochure published by Wheelabrator Corporation, Mishawaka, Ind. This profusely illustrated booklet includes the following other categories of cleaning and finishing in its large collection: descaling of hot rolled steel strip, sheet, slabs, billets, and structural steel; etching steel mill rolls; cleaning tubing, soil pipe, steel drums, sanitary ware, and many other items. The shot peening process is also treated.

Stortswelded coils cut costs where it counts

PRECISION workmanship to assure correct shaping and dimensional accuracy—Storts quality weldmanship to provide full section, full strength joints and overall structural soundness—applied to your needs for special coils to order—result in long service life, elimination of repair and replacement expense and freedom from costly production interruptions.

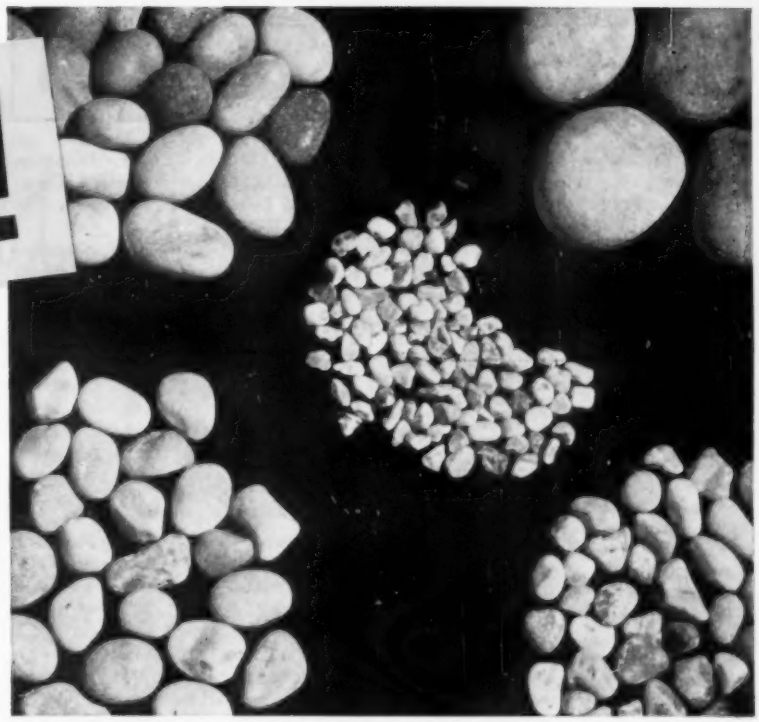


42 STONE STREET — STORTS WELDING COMPANY INCORPORATED — MERIDEN, CONN.

Manufacturers of Welded Fabrications to Specification

NEW!

TUMBLEX "N" Abrasive



PROCESSED BY NATURE and offered exclusively by Norton, the new Tumblex "N" Abrasive comes in sizes ranging from 3/16" by 3/8" to 1 5/8" by 2 1/2".

A natural for better barrel-finishing

Latest tumbling abrasive — natural flint stone — offers new "TOUCH of GOLD" benefits — brings finish up and costs down

Tumblex "N" Abrasive is Nature's own tumbling abrasive. Carefully selected and graded by Norton, it opens up new possibilities for barrel-finishing applications such as light deburring, breaking sharp edges, polishing and burnishing and other operations where little actual cut is required.

Tumblex "N" has proved particularly valuable in bringing out the most desirable color of the finished part. Metals on which it has proved its ability to give an excellent finish include zinc, brass, copper, aluminum and various forms of steel, including stainless.

Its rounded, uniform shape and very low breakdown ratio prevent wedging, permit longer cycles and reduce the need of rescreening.

Another big Tumblex "N" advantage is extremely uniform cutting action. This assures the same uniform finishing in load after load. Also, it enables close regulation of cut; for example, by adding measured quantities of loose abrasive grain to Tumblex "N" you can speed up the rate of cut with little effect on the life of this natural abrasive. Exact formulas for best results in job or production tumbling are easily worked out.

Norton customers who have tested Tumblex "N" Abrasive report:

- *"Very good luster with no noticeable wear."*
- *"Fine performance. Very little breakdown. Reordering 700 pounds of sizes 2½T and 3½T."*
- *"Color O.K. on both zinc and brass."*
- *"Very long life. Gave excellent color on stainless steel."*
- *"A good polishing stone on aluminum."*

Send Your Work Samples

Let us demonstrate in our newly enlarged Sample Processing Department how Tumblex "N" Abrasive can give the value-adding "Touch of Gold" to your product quality and cut your barrel-finishing time and costs. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass. G-297

NORTON
ABRASIVES
Making better products... to make your products better

NORTON COMPANY
Abrasives • Grinding Wheels
Grinding Machines • Refractories
BEHR-MANNING DIVISION
Coated Abrasives • Sharpening Stones
Pressure-Sensitive Tapes

Equipment and Supplies...

E—120. Induction Heaters—A new line of electronic-type induction heaters, featuring a total of 16 models in four output ratings for brazing, soldering, surface hardening, and annealing, has been introduced by General Electric Company's Industrial Heating Department.

The many new combinations of models and ratings will make available to industrial users that heater which will best suit their specific operating requirements, according to E. W. Cunningham, department general manager.

The new line consists of induction heaters which have been rated: 7½-kw, 15-kw, 25-kw, and 40-kw output. Each heater model is offered with combinations of thyratron power control, built-in output transformer, or tapped-tank coil. The resulting flexibility makes these heaters adaptable to a wide variety of induction heating loads and applications.

E—121. From 70 to 200—Wyandotte Expray (AP)—all purpose—newest product in Wyandotte Chemicals line of metal cleaners, has been found to be effective for spray cleaning from 70° to 200° F. Expray contains a rust inhibitor to protect cast iron and steel between manufacturing operations. Users find that it gives good detergency in all waters at all temperatures, and cuts maintenance costs in washers with the elimination of clogging and scaling.

E—122. Dull Chrome vs Glare—Dull-chrome finished vernier slides are the latest improvement in the well-known Mauser Vernier Caliper. This vernier caliper, best known as No. 101, only recently was changed to all stainless steel, making it rustproof against atmospheric conditions and perspiration from hands.

The newest improvement, dull-chrome finish on the vernier scales, will eliminate glare and reflection given off by ordinary bright steel, resulting in faster, more accurate readings and measurements

E—123. Flexible Tubing—Announcement has been made of the new Conax Flex-tube Assemblies by the Conax Corporation, Buffalo, N. Y

These new Conax Flex-tube Assemblies include neoprene covered flexible tubing which are factory assembled with end fittings having standard male or female pipe thread connections for quick, easy installation and neat appearance.

The Underwriters Laboratory approved tubing is galvanized steel or brass, interlock construction with an overall neoprene cover. This construction gives permanent leak-tight and vapor-proof protection against oil, grease, water, dirt, chemicals, corrosive fumes and other destructive agents.

Conax Flex-tube Assemblies are made in several standard lengths and are available in any required length for special application.

Standard end fittings are cadmium plated of brass or steel, or Conax Stainless Steel Packing Glands can be provided in place of end fittings. Many special adaptations of Conax Flex-tube Assemblies to standard and special Conax Thermocouple Glands are available completely assembled at factory.

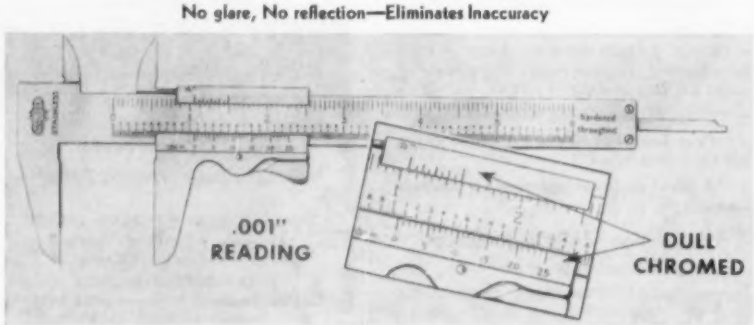
E—124. Wide Face Polisher—The Murray-Way Corporation of Birmingham, Mich.—designers and manufacturers of automatic polishing, buffing, grinding and filtering equipment—announce the development of a new wide face polishing wheel.

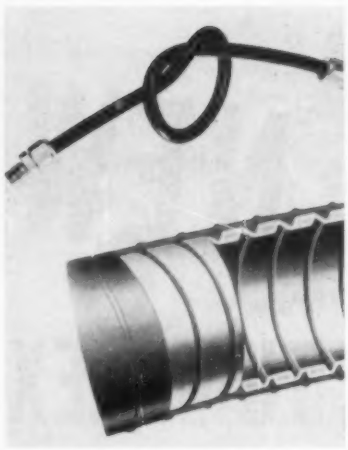
Known as the No. 53, this new polisher with built-in Murray-Way Floating Action will handle widths up to 24 inches.

The Floating Action of the No. 53 gives an even buffing and polishing on the entire surface. It simplifies the positioning of the work piece and once the proper pressure is established hundreds of pieces can be uniformly processed.

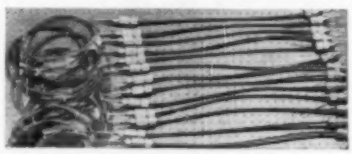
The No. 53 cuts down the number of heads necessary to process work pieces, greatly reduces the number of passes needed to polish the work piece and gives the ultimate in positioning flexibility.

No glare, No reflection—Eliminates Inaccuracy

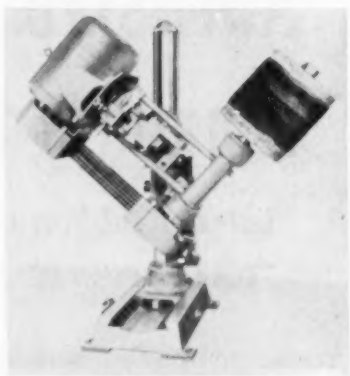




Flexible construction



With End Fittings



Floating Wide Polisher

All Purpose Cleaner

ALWAYS FINISHES FIRST

—and saves on compound—it's "metered"!

Liquimatic®

the perfect liquid compound for all metal finishing

How much of the compound in your buffing room is wasted... in the nubbin pile, or in "over-heading" buffs? There's a way to "meter" the compound you use—the Liquimatic way. An electrically timed system in the Liquimatic Process feeds the exact amount of liquid compound for the exact cut you need. While compound is being saved, buffs are being saved too ... continual lubrication extends buff life up to 400%.

These two cost-saving advantages alone soon pay for a complete Liquimatic Application System. But there are still other ways Liquimatic will help you cut costs. No hand application, and no changing of bars will effect substantial down-time savings for you... and Liquimatic's ease of cleaning means even further economies. Now—when production must be upped, and costs lowered — profit from Liquimatic—over and over again.

Check the other features of Liquimatic ... then write today for your free copy of Liquimatic's big, new folder that tells the whole cost-saving story of Liquimatic in *your* buffing room.

These additional Liquimatic features mean real savings in terms of time, money, safety—

- longer buff life
- completely automatic
- fast cutting
- easy cleaning
- non-settling
- high flash point
- long storage life
- sprayable viscosity
- adhesive slow-wearing buff face

Liquimatic ...

gives more buff mileage

1427

PLATEMANSHIP

Your H-VW-M combination—of the most modern testing and development laboratory—of over 80 years experience in every phase of plating and polishing—of a complete equipment, process and supply line for every need.

HANSON-VAN WINKLE-MUNNING COMPANY

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H-VW-M

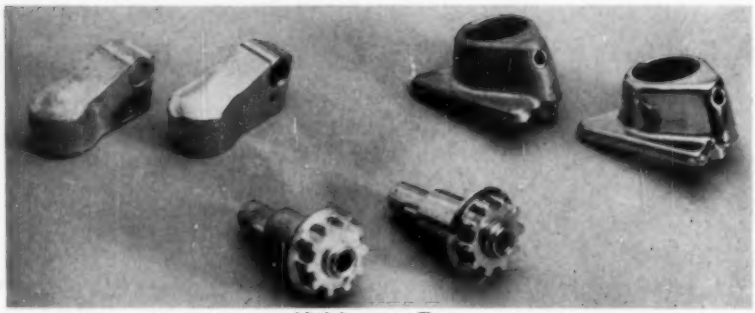
INDUSTRY'S WORKSHOP FOR THE FINEST IN PLATING AND POLISHING PROCESSES • EQUIPMENT • SUPPLIES

EQUIPMENT & SUPPLIES

E—125. Versatile Solderer—Solutions to some of the tough problems in the assembly of dissimilar ferrous and nonferrous metals are heralded by the introduction of two special silver alloys announced by All-State Welding Alloys Co., Inc., White Plains, N. Y. They are designed for use in joining aluminum, copper, brass, bronze, stainless steel, steel, monel and combinations of these and other metals.

Both of the new products are compounded for use with any heating method generally applicable in soldering. Melt and flow points are in the medium temperature range falling between soft solders and low temperature brazing alloys.

E—126. Extra High Color with Barrel Finishing Compounds—The ESBEC Barrel Finishing Corporation of Byram, Conn., has recently announced two new barrel finishing compounds for use on zinc die castings which are producing such exceptional results that it is often possible to avoid even final color buffing before plate.



High Luster on Zn

ESBEC No. 655 is a new type of abrasive compound which is used primarily with natural chips for edge breaking and surface finishing of all types of zinc die castings.

ESBEC No. 205 is a liquid burnishing compound which produces a natural color and an ultra high lustre on zinc die castings.

Wherever corrosion-resistant paint is used—

TYGON ATD* Hot Spray PAINT

cuts job costs to the bone!

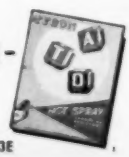
Using any standard hot spray equipment, Tygon ATD builds a vinyl film 5 mils thick, with just two passes. No thinners are needed. Heat at 160° reduces ATD to spraying consistency. The low solvent content evaporates on atomization, leaving a dense, high solids vinyl film which is quick-drying, smooth and glossy. And it is highly resistant to corrosion.

You'll save up to 20% on materials *and* up to 30% on labor with Tygon ATD Hot Spray Vinyl Paint, so . . .

- Saves up to 20% on material
- Saves up to 30% on labor
- Less overspray—low paint loss
- Faster—5 mils in two coats
- Perfect edge build-up

Get the complete story –

Write today for Bulletin ATD-9.



193E

PLASTICS AND SYNTHETICS DIVISION

U. S. STONEWARE

AKRON 9, OHIO

ADHESION • THICKNESS • DENSITY

E—127. Plating Rectifiers with Automatic Programming—Rapid Electric Company, New York, has developed "Voltage Sensing," in conjunction with their Selenium and Germanium rectifiers. These rectifier units automatically increase the output voltage as the load or current demand is increased. Developed for automatic plating operation, its use can be extended to other electrolytic applications where a greater degree of constant current density is required.

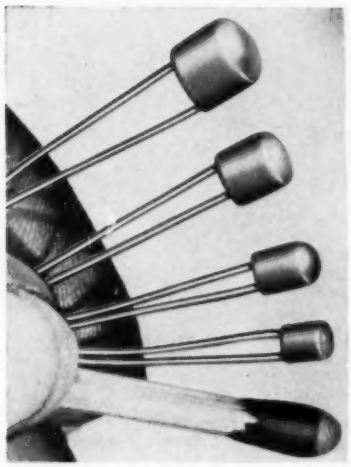
The amount of voltage increase with increasing load may be varied by a simple control which is preset. In automatic program plating, during a fully automatic plating cycle, and as succeeding racks are added to the solution, (increasing load) the voltage requirement increases in order to maintain a required current density in all the work. At the end of a plating period the voltage automatically decreases to prevent excessive current density or burning of the remaining pieces of work. Constant current control through Rapid Electric Voltage Sensing will offe immediate economic results in view of elimination of human error, decrease in required labor, improvement of plating quality and radical reduction of spoiled work.

Any sequence of plating operations can be made completely automatic through the use of Rapid Electric automatic programming equipment.

Either Selenium or Germanium power units can be combined with program timing equipment for automatic operation of any series of plating steps.

A number of synchronous timers housed in a single cabinet with interlocking circuits and controls will start, stop, and time any number of separate operations in any sequence without supervision or interruption.

The use of such timers, plus a motor-driven auto-transformer controls the output in pre-set time intervals for complete pre-strip and finishing operations.



A Match Head is Larger

E—128. Little Giants—Newly developed sub-miniature selenium diodes Types 6U1, 7U1 and 8U1, are being produced by International Rectifier Corporation to provide bias for tubes in diversified commercial and military electronic equipment that must withstand severe environmental conditions. Type 6U1 is rated for a maximum input of 156 v rms, type 7U1, 182 v rms and type 8U1, 203 v rms at 1.5 ma. These diodes are designed for stable operation in an ambient temperature range of minus 50° C to plus 100° C. These selenium diodes are small and compact in size and are provided with pigtail leads to facilitate easy wiring into crowded chassis.

E—129. Permanent Dry Lubrication—A new, permanent and dry lubrication process called USECO-Lube is now available for application to all metallic surfaces. This new method is most beneficial where ordinary oils and greases are not feasible or desirable; and is especially valuable in cases where parts must function without failure.

USECO-Lube impregnates and film coats any metallic surface and leaves no surface build-up. Impregnation into the metal pores assures the presence of the lubricant even after prolonged wear.

Oxidation, corrosion and friction are greatly reduced and "sticking" is prevented. With USECO-Lube, effective lubrication is provided at temperatures ranging from 30° below zero to 800° F. These factors increase the life of metallic parts subjected to friction of any nature, increase efficiency and result in greatly reduced maintenance costs.

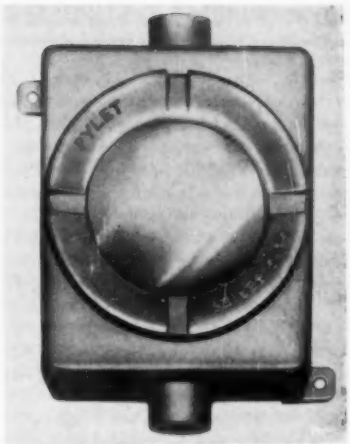
A product of U. S. Engineering Company, Detroit, Mich., USECO-Lube process can be applied to permanently lubricate any metal part—regardless of size or shape.

To demonstrate the effectiveness of this new, revolutionary, dry lubricant, sample metal parts will be USECO-Lube treated for test purposes without charge.

E—130. Explosion-Proof Instrument Enclosure—For convenient reading of enclosed meters, gauges or similar devices in hazardous locations, the Pyle-National Company, Chicago manufacturer of industrial electrical products, has developed a new series of instrument enclosures which makes it unnecessary to open the enclosure when taking readings.

Equipped with a threaded cover and a heavy round glass window, the Pylets are furnished in four body sizes with $\frac{3}{4}$ inch hubs for rigid conduit in both dead end and through feed types. Other hub arrangements are available. Drilled mounting feet are provided.

The enclosure is explosion-proof, dust-tight and rain-tight.



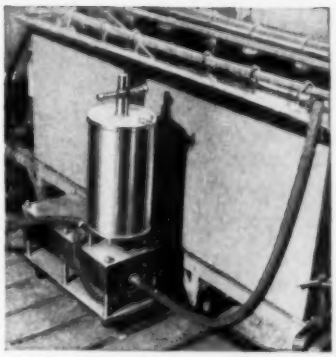
No Explosion, No Dust, No Rain

LOOK

No Rejects

NO pitting, spotting, or reworking . . . . . .

Impurities—primary cause of pitting, spotting, rejected finished work—are positively eliminated by the Alsop "Sealed-Disc" Filter. That's because they're designed for Platers—to meet plating room requirements. That's why they're compact, portable—smaller than conventional filters—save valuable space—yet capable of handling equal volumes of solutions.
Simplicity of design cuts operating time and labor—means savings for you. Check its many additional proved performance features and know why more platers depend on "Sealed-Disc" Filters. Ask your regular plating supplier—or write for details.



"Sealed-Disc" Filters remove more impurities with less effort and in less time. Use it on your acid dips, electro cleaners, and solvents too.

ALSOP Positive Filtration

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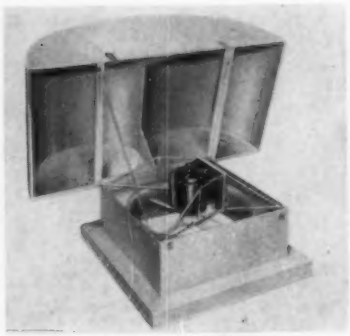
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 124.

EQUIPMENT & SUPPLIES

E—131. Rubberized Abrasives—To meet a popular demand in general industry, Cratex Manufacturing Co., has just developed an inexpensive, yet comprehensive polishing kit to handle deburring, smoothing and polishing applications. The kit contains an assortment of 24 of the most popular Cratex Polishing Wheels, Cones, Blocks and Mandrels which are in wide use in industry—for cleaning and polishing molds, dies and castings . . . removing film, coatings and enamel . . . blending in and polishing welded seams after rough grinding . . . polishing bearing surfaces and raceways . . . cleaning and polishing commutators and contact points . . . and removing rust, heat marks, tarnish, excess solder, scratches and corrosion.

Each Cratex Polishing Kit contains full instructions on the application of Cratex Rubberized Abrasives perfected to give a "cushioned action performance" in burring, smoothing and polishing on hard or soft metals, plastics, ceramics, glass and other materials.

Cones, Blocks & Polishing Wheels


Air In or Air Out

E—132. Reversible Roof Ventilator—A reversible roof ventilator, which moves air in either direction with almost equal efficiency, is now being manufactured by the Hartzell Propeller Fan Company, Piqua, Ohio.

Under normal exhaust conditions, the new unit operates like any other roof ventilator, but at the flick of the switch it can be converted into an intake unit, pouring down a powerful blast of cool outside air.

The Hartzell Reversible Roof Ventilator is now being made in 28 in, 36 in and 44 in sizes with a capacity range from 5500 cfm to 23,600 cfm for exhaust (the range for intake operation is 5340 to 22,300 cfm). It can be supplied in all sizes for flat roof or peak installation.

E—133. Steam Gun—The Oakite Hurriclean Gun—designed for steam cleaning efficiency, cool handling, and easy operation—has recently been introduced by Oakite Products, Inc., manufacturers of industrial cleaning and sanitizing materials and equipment.

Efficient Gun

The most revolutionary feature of this new solution-lifting steam gun is the way in which the cleaning solution is used to protect the operator from the heat of the steam. Where other similar steam cleaning devices have had separate tubes for solution and steam, the Oakite Hurriclean Gun uses a tube within a tube—steam passing through the insulated interior tube, solution through the exterior. The steam loses none of its heat, but the cleaning solution reduces the external temperature of the gun.

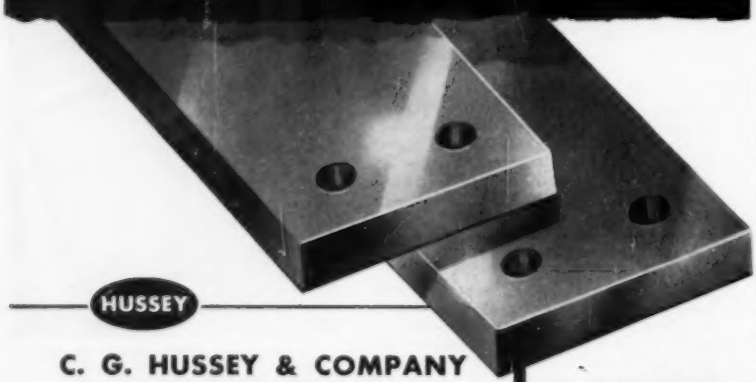
The solution is automatically drawn into the nozzle of the gun by the partial vacuum created by the steam passing through.

There is a difference!

HUSSEY

Plating Quality

COPPER ANODES



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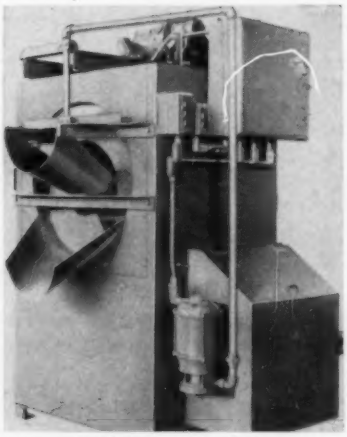


Batch Washer of Small Parts

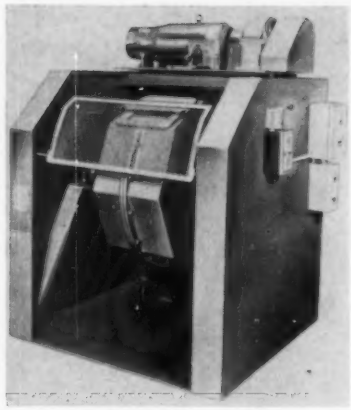
E—134. Batch Washer of Small Parts—Small parts can be high-pressure spray-washed economically in bulk by means of a new small rotary-drum batch-type machine recently perfected by The Alvey-Ferguson Co., Cincinnati, Ohio.

Parts batches are introduced into the machine through the upper chute. The new A-F one-man-operated machine utilizes a drum with helical spiral to tumble parts gently and expose all surfaces thoroughly to the high-pressure fan-shaped spray nozzles inside the drum. The drum, perforated to permit draining of the solution, oil, chips and impurities, retains only the clean, thoroughly-washed parts. On completion of the cleaning cycle, the drum counter-revolves, automatically discharging the clean parts into a tote box or other suitable container by means of the lower chute.

Location of both chutes on the same side of the machine minimizes space requirements and permits installation directly against other machinery, walls or supporting structures.

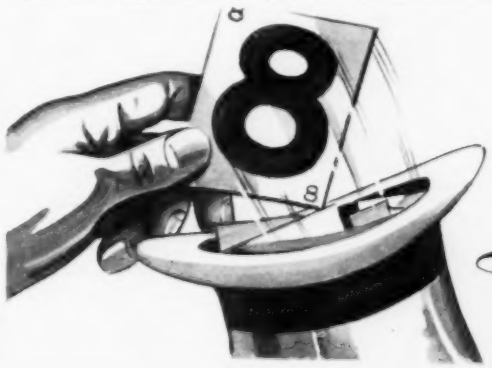
The washing, pumping, drum-reversing cycle can be either manual or automatic. If the installation is automatic, an adjustable timer is provided. Complete draining and quick flash-dry for all parts is accomplished through tumbling with pump off as parts are discharged.

E—135. Triple Action Cutting Barrel—The Hartford Steel Ball Co., Hartford, Conn., has introduced into their line of famous Triple Action Cutting Barrels two new fully enclosed models with 10 and 4 cu ft capacities. In both design and construction Hartford engineers have incorporated the features that both large and small users of barrel finishing have indicated they wanted most. These barrels speed deburring, descaling and polishing on screw machine parts, stampings, castings. Parts can be quickly and economically processed by any tumbling method—abrasive chip process, ball and steel shape process, branded compound or other medium for special jobs.



Three-way Barrel

The power unit is on top for long life, cleanliness and ease of maintenance. This feature also permits extremely compact design. Other labor and time-saving features include greater accessability of controls which are grouped together; drum type reversing switch; 24 hour program timer that can be set for any cycle from 15 minutes to 24 hours with completely automatic control; magnetic starter and brake which permit inching of barrel into loading and unloading positions, tilt-back front safety guard; and improved 4 speed gear shift control, permitting standard RPM barrel speeds of 8 - 11 - 18 and 33 on 10 cu ft model and slightly higher proportionate speeds on 4 cu ft model. Other speed ranges can be supplied. Optional features include single speed or fully variable speed drives; special hollow shaft with rotary pressure joint that permits permanent water connections for faster filling and flushing of barrel. These models can also be supplied with Neoprene lined barrels. As a safety feature barrels have pressure vent in cover.



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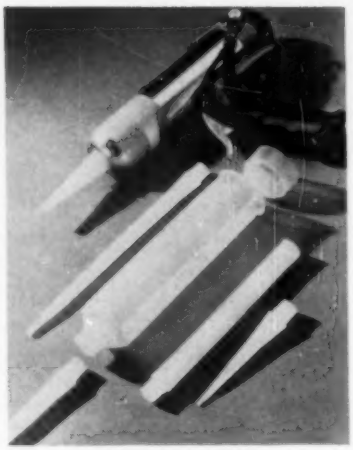
EQUIPMENT & SUPPLIES

E—136. Throw-away Caulking Gun—New sealant gun designed to speed sealing operations in aircraft and other assembly work uses disposable cartridges and nozzles molded of Tenite polyethylene.

Cartridges containing caulking compound fit into the gun barrel. Threaded nozzles, available in a variety of sizes and shapes, screw into the front end of the cartridges. A press of the trigger turns on air pressure, causing the sealant to extrude smoothly and automatically. When the supply of sealant is exhausted or the job completed, the polyethylene parts can be easily discarded to eliminate cleaning time and costs.

They are assembled and distributed by Pyles Industries, Inc. of Detroit, Mich.



Disposable Cartridges

Primer

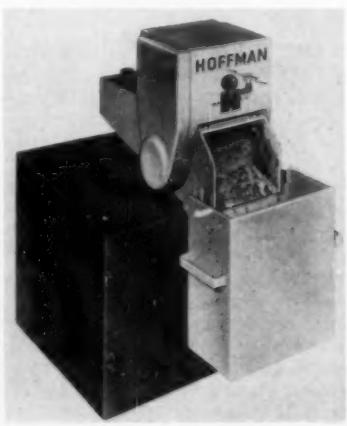
E—137. Smooth Spray for Priming—The nation's largest manufacturer and distributor of spray coatings in aerosol containers, Krylon, Inc., has announced it is producing Zinc Chromate Primer spray under the Krylon label.

Zinc Chromate, used to prepare bare metal surfaces for final paint or other coatings, is the newest in an expanding Krylon line. It can be sprayed onto any bare metal quickly and evenly with the Krylon aerosol container, thus saving considerable time and labor in finishing metals of all kinds. Enamel over the Krylon primer will not peel or crack.

Krylon Zinc Chromate Primer spray will not settle hard in the container. It sprays on smoothly and dries with a firm finish in a matter of minutes.

E—138. Coolant Clarifier—The Industrial Filtration Division of U. S. Hoffman Machinery Corporation has expanded its line of filtration equipment with the addition of a coolant clarifier known as the Roto-Flo 15 Magna Grip. The Roto-Flo unit is a magnetic separator type clarifier

Coolant Filter



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FOR WITH A Globe YOUR NEEDS WILL BE MET,
IT TAKES THE EDGE FROM ALL THINGS ROUGH,
NO MATTER HOW FRAGILE, HEAVY OR TOUGH.

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Let CASALBI's experimental engineering service analyze your parts finish needs. Send samples of parts and completed piece to show desired finish. CASALBI will provide detailed cost-saving finishing recommendations. Write today! No obligation, of course.

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Lea-Michigan, Inc., our Michigan Affiliate, is now well into production on several Lea Finishing Specialties widely used in industry. For example:

Polishing Specialties

LEA LIQUABRADE . . . . . liquid, non-flammable buffing composition, available in a wide range of abrasive types and sizes; especially advantageous in automatic production line finishing

LEA GRIPMASTER . . . . . liquid polishing wheel sizing, containing no abrasive, for bonding medium to coarse grit abrasives on wheels and belts

LEA PLASTI-GLUE . . . . . liquid polishing wheel sizing, containing no abrasive, for bonding finer grit abrasives on wheels and belts

LEABRAMENT . . . . . quick drying, liquid abrasive composition for burring, polishing and satin finishing; formulated with medium to heavy cutting grit abrasives

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DETROIT

LEA COPPER-GLO . . . . . effective addition agent used only with the LEA-RONAL High Speed Bright Copper Plating Process. Makes it practicable to plate copper on prefinished steel and die-castings and then plate chrome directly without intermediate nickel or buffing. The LEA-RONAL Bright Copper Process is so successful in improving plating and/or lowering costs, we suggest that every plant operating with cyanide copper investigate it

SUPERTARTRAL . . . . . superior addition agent to replace Rochelle Salts applicable to any cyanide copper bath, providing smooth deposits and excellent anode corrosion

You can order any of the above items from LEA-MICHIGAN, INC., 14066 Stansbury Avenue, Detroit 27, Michigan and get immediate service to all Midwestern points. Our laboratory technicians located here are available for competent technical service by merely picking up your phone. Production in and shipments from LEA-MICHIGAN are indicative of our broadening service to industry through our nation-wide distributor organization backed up by strategically located manufacturing facilities.

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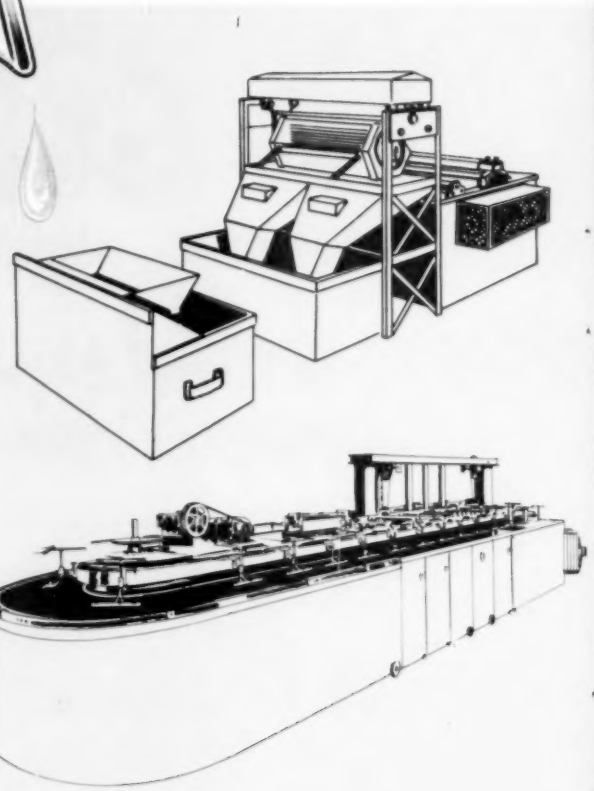
Lea-Ronal Bright Copper process

Tolerant to Contaminants

- Chrome
- Zinc
- Carbonates



. . . while consistently producing a high speed, buffable, bright plate through the use of Lea Copper-Glo.

The extensive tolerance of the Lea-Ronal Bright Copper Process to contamination has been proved at the many plants using this cyanide copper process. Recommendations available from our engineers and laboratories provide the "aspirins" for conditions which are the "headaches" of conventional cyanide copper plating.

How about your copper plating process? Can the same be said for it? Or is there a constant battle with contamination and constant uncertainty as to uniformity and quality of plate and even as to the length of the plating cycle?

You should investigate the use of Lea Copper-Glo in the Lea-Ronal Bright Copper Process. In all probability your present solution can be converted to this proved superior process. You can be confident that you can obtain this high tolerance to contaminants and the better plating in general that hundreds of plating shops and industrial plants are already enjoying in their cyanide copper plating.

In writing for the newly revised Copper-Glo technical manual, please describe fully your present problems and requirements.

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serving the Finishing Field

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REPORTS FROM ALL OVER

. . stripped, cleaned and degreased

(This section is especially compiled for the readers of PLATING; here the world in which we work and operate is stripped of its veneer, cleansed of its distortions and carefully degreased of superfluities.)

Never before as now has the resilient characteristic of our economy been affirmed. Following the jolting news of President Eisenhower's heart attack, two extreme reactions were noted: The overly pessimistic and the overly optimistic. Both were wrong. The facts are: (1) There is no tendency toward over confidence or even complacency. The threat of inflation has faded. (2) There is no change in the basic force underlying the economy. . . . Total US research spending over the last 25 years totaled $30 billion, but gave a 13–1 return on investment, according to a leading electronics firm. . . . The greatest amount of research compared to sales is in drugs, then in electrical machinery, then industrial chemicals, according to *H. Haas, Sugar Research Foundation.*

Grinder loader: a turret-type device is said by *Norton Co.*, Worcester, Mass., automatically to load workpieces between centers and remove the pieces when ground. The work is supported near both ends. . . . Self-dressing grinding wheels by *Electro Refractories & Abrasives Corp.*, Buffalo, reportedly can operate at high speeds at cooler temperatures as a result of a porous filler which breaks under impact, opening up pores in which coolants can be held.

The Dalic "advanced" process for electroplating localized areas (such as plating the leading edges of prop blades) is now available in the US from *Marlane Dev. Co.* It uses newly-developed styli (air- and water-cooled) and nontoxic metallo-organic solutions.

A sub-surface water scrubber, for combating backwash difficulties in waters not turbid enough to call for clarification but still containing enough solid soluble solids to plug softeners and filters, was introduced by *Graver Water Conditioning Co.*, NYC to break up and remove dense precipitates, and fibrous materials which mat bed surface.

Within a few years, commercially-produced elemental boron may be turned out at 2–3 million lb/yr. *Pacific Coast Borax* is offering ton lots of 95–97% amorphous boron at $12–15/lb, and 90–92% grade at $10–13/lb.

New rust-preventive greases were advertised by *Sun Oil Co.*, Phila. as being specially fortified to protect against wet operating conditions and to give improved lubrication. Effective life is claimed to be about twice that of conventional greases operating under wet conditions.

adoria

ALUMINUM—(99 per cent pure plus ingot)	24.40
CADMIUM—(Platers' quotation)	$1.70
CHROMIUM—Electrolytic Cr. (99 per cent), Fe (0.3 per cent max), C (.20 per cent max)	$1.27
Less than ton lots	$1.29
COPPER—Electrolytic, domestic	43.00
GOLD—(per oz U. S. price)	$35.00
LEAD—(Common, New York)	15.50
MAGNESIUM—(Ingot, F.O.B. Newark)	33.90
(Sticks, 1.3 in diameter, 100 lbs or more)	53.00
MERCURY—(per 76 lb small quantities)	$280.00–$284.00
NICKEL—(F.O.B. Port Colborne U. S. Duty Included)	64.50
Electrolytic Cathodes (sheets loose)	64.50
PLATINUM—(refined per oz)	$97.00–99.00
RHODIUM	$120.00–125.00
SILVER—New York (per oz)	90.16
TIN—(Spot Delivery)	109.25
(Prompt Delivery)	109.25
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	Standards Relating to Electrodeposited Metallic Coatings
A 164 – 55.	Spec. for Electrodeposited Coatings of Zinc on Steel
A 165 – 55.	Spec. for Electrodeposited Coatings of Cadmium on Steel
A 166 – 55 T.	Spec. for Electrodeposited Coatings of Nickel and Chromium on Steel (Tentative)
A 219 – 54.	Methods of Test for Local Thickness of Electrodeposited Coatings
B 117 – 54 T.	Method of Salt Spray (Fog) Testing (Tentative)
B 141 – 55.	Spec. for Electrodeposited Coatings of Nickel and Chromium on Copper and Copper-Base Alloys
B 142 – 55.	Spec. for Electrodeposited Coatings of Nickel and Chromium on Zinc and Zinc-Base Alloys
B 177 – 55.	Rec. Practice for Chromium Plating on Steel for Engineering Use
B 183 – 49.	Rec. Practice for Preparation of Low-Carbon Steel for Electroplating
B 200 – 55 T.	Spec. for Electrodeposited Coatings of Lead on Steel (Tentative)
B 201 – 55 T.	Spec. for Chromate Finishes on Electrodeposited Zinc, Hot-Dipped Galvanized, and Zinc Die-Cast Surfaces (Tentative)
B 242 – 54.	Rec. Practice for Preparation of High-Carbon Steel for Electroplating
B 252 – 53.	Rec. Practice for Preparation of Zinc-Base Die Castings for Electroplating
B 253 – 53.	Rec. Practice for Preparation of and Electroplating on Aluminum Alloys
B 254 – 53.	Rec. Practice for Preparation of and Electroplating on Stainless Steel
B 281 – 53 T.	Rec. Practice for Preparation of Copper and Copper-Base Alloys for Electroplating (Tentative)
B 287 – 54 T.	Method of Acetic Acid-Salt Spray (Fog) Testing (Tentative)

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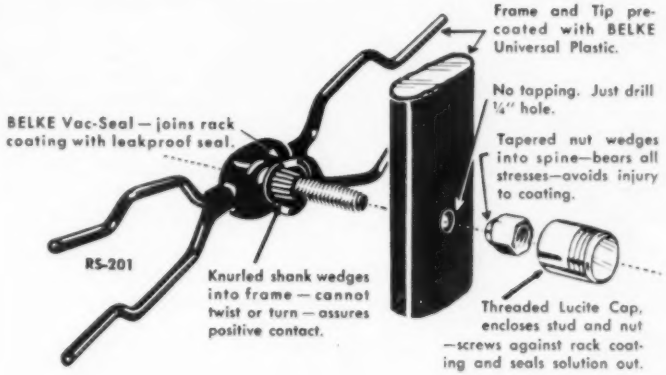
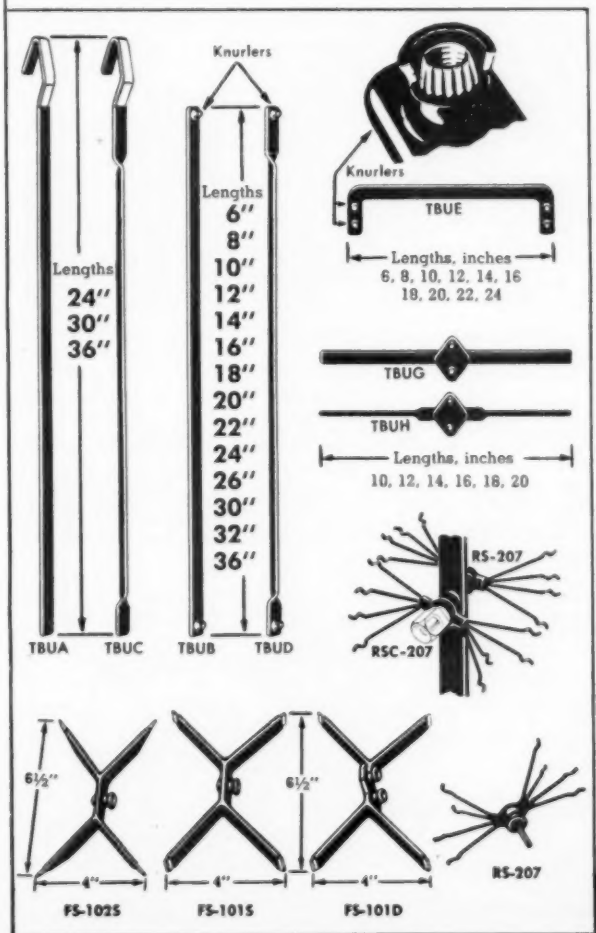
No Waiting--BIG Saving

With BELKE Thinker Boy Plating Rack Assemblies


Frame and Tip pre-coated with BELKE Universal Plastic.
No tapping. Just drill ¼" hole.
Tapered nut wedges into spine—bears all stresses—avoids injury to coating.
BELKE Vac-Seal—joins rack coating with leakproof seal.
RS-201
Knurled shank wedges into frame—cannot twist or turn—assures positive contact.
Threaded Lucite Cap, encloses stud and nut—screws against rack coating and seals solution out.

Booths 355 and 356 Cleveland Show

You can be ready to plate in minutes



An investment-- not an expense!

When Thinker Boy Racks are no longer needed *they do not become useless as do other racks–*

You can quickly change the tips, change spacing of the tips or convert Thinker Boy Racks to other designs–

With an accumulation of Thinker Boy Members and Tips, *you can have specially designed racks for the mere cost of assembly*–be ready to plate a new job efficiently in minutes or hours instead of days or weeks.

Amazing Adaptability

Thinker Boy affords amazing advantage in efficiently meeting widely varied racking needs.

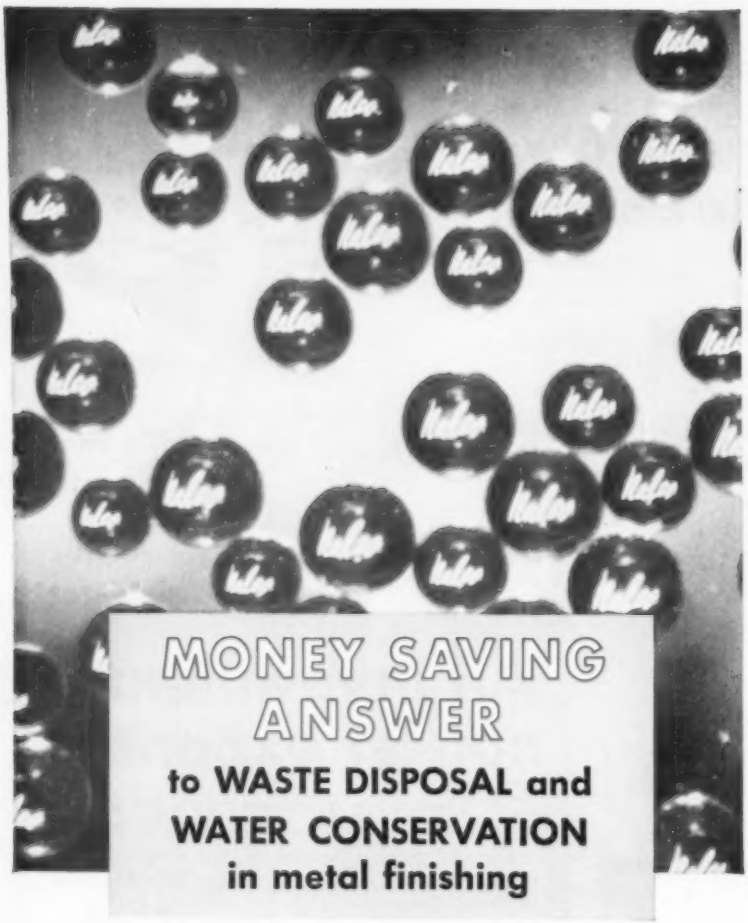
You can assemble racks of just about any style or type. You can have the exact tip arrangement and spacing that suits the job. *You can adjust Thinker Boy Tips to hold an unbelievable variety of articles.*

New literature, just off the press, shows how. Illustrated Thinker Boy Rack Members and Thinker Boy Tips. Shows how to assemble many different types of racks and how to adjust standard Thinker Boy Tips.

Ask your BELKE Service Engineer or write.

Belke Manufacturing Co.
947 N. Cicero Ave., Chicago 51, Ill.

EVERYTHING FOR PLATING PLANTS



● Photomicrographed above are tiny Nalcite® Ion Exchanger spheres—the answer to your problems of waste disposal and effective water conservation in plating and anodizing processes.

Nalco Ion Exchangers can serve you two ways:

Cation exchange treatment of plating solution recovers chromic acid... assures nearly 100% use of chrome, and eliminates complaints about toxic wastes.

Deionization of rinse solutions recovers chrome and eliminates drag-out losses ... provides pure, reusable water for a perfect spot-free rinse. Cost-wise, Nalco's recovery and reuse program will save you money.

TECHNICAL DATA

Complete technical data on Nalcite Ion Exchangers' performance and characteristics are yours for the asking. Write for Report "Ion Exchange in Metal Finishing."

NATIONAL ALUMINATE CORPORATION
6301 West 66th Place • Chicago 38, Illinois
In Canada: Alchem Limited, Burlington, Ontario

Nalco®
PRODUCTS . . . Serving Industry through Practical Applied Science

designed for completely automatic cleaning of machine tool coolants. The unit requires absolutely no floor space as it can be mounted directly on existing coolant tank facilities or on any part of the machine.

The unit is constructed so that the flow of coolant is always in complete contact with a permanent magnetic drum as it passes through the clarifier. Drum speeds may be varied to suit different types of coolants.

The coolant, upon leaving the machine, passes under the revolving drum of solid Alnico, which is permanently charged. Here, the coolant is directly exposed to the magnetic drum without interference from non-magnetic insulators. The drum, revolving against the flow of coolant passing below, uniformly and effectively attracts or separates the ferrous materials in the coolant. Separated material is removed from the drum by a non-magnetic scraper and is deposited in an easily-removed sludge pan.

The unit is driven by a 1/50 hp (max) worm-gear speed-reducer motor equipped for 110-volt, 60 cycle current. It is also available with motors equipped for 220 or 440-volt operation. The Roto-Flo is chain driven with various sprockets supplied for different drum speeds. A motor driven squeegee or wringer synchronized with a drive-motor is furnished as standard equipment. The unit, including removable sludge pan is 28 in long, 23 in high, and 10¼ in wide, and has a gross weight of 108 lbs.

E—139. Vac-U-Max is the new, powerful suction, modern industrial vacuum cleaner that operates by use of compressed air only. Its operation is based on a simple aerodynamic principle. Compressed air passed thru a jet-venturi, creates a very high vacuum.

Vac-U-Max, connected to existing compressed air line, develops more than two times the suction of a standard one hp electric unit that is equivalent in size. Its suction power is even greater than a 7½ hp electric type.

High Powered Vacuum

11:00 A.M. EST: Merchants' New York office receives local phone call from troubled purchasing agent. Can you help us? Our Chicago plant needs 5 drums trichlorethylene *immediately*.

11:06 A.M. EST: Message goes out by teletype to Merchants' Chicago office, where rush order and delivery instructions are relayed to adjoining warehouse.

10:20 A.M. CST: Five drums of trichlorethylene are loaded on small delivery truck.

10:45 A.M. CST: Shipment arrives at customer's plant, less than an hour after initial call.

Ordered at 11:00 A.M. EST; Delivered at 10:45 A.M. CST

MERCHANTS CHEMICAL BEATS THE CLOCK!

For thirty-five years Merchants Chemical has made a habit of special service and prompt service in the distribution of industrial chemicals. The list of products includes acids, alkalis, fungicides, surfactants, chlorinated solvents, emulsifiers, laundry compounds, soaps, dry ice and chemical specialties.

In the instance outlined here, Merchants actually beat the clock in an effort to get material to a customer when and where he needed it. Close cooperation and an efficient communication system among the nationwide Merchants' offices made it possible. Wherever you locate, Merchants can serve you.

SERVICE QUALITY MERCO

MERCHANTS CHEMICAL COMPANY, INC.

60 East 42nd Street, New York 17, N. Y.

SALES OFFICES AND WAREHOUSES: CHICAGO • CINCINNATI • DENVER • LOUISVILLE • MILWAUKEE • MINNEAPOLIS • NEW YORK • OMAHA

STOCK POINTS: ALBUQUERQUE, N. M. • ERWIN, TENN. • S. NORWALK, CONN.

HERE'S A TIP ON
CHROMIUM PLATING

INSTALL POWERS Automatic Temperature Control For All Metal Finishing Processes

For plating tanks and other metal finishing processes. Powers Controls quickly pay back their cost by accurately holding solutions at a constant uniform temperature.

POWERS

3

TECHNICAL DATA SHEET
CHROMIUM

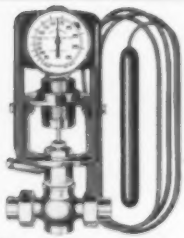
IF you plate—CHROMIUM

***Too high a temperature* can result in:**

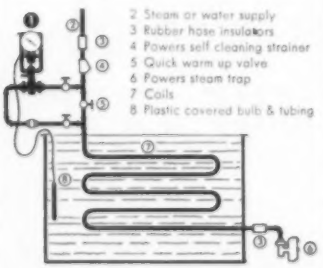
1. Burnt deposits
2. Frosty deposits
3. A decrease in cathode efficiency
4. A loss in throwing power
5. A soft deposit

***Too low a temperature* can result in:**

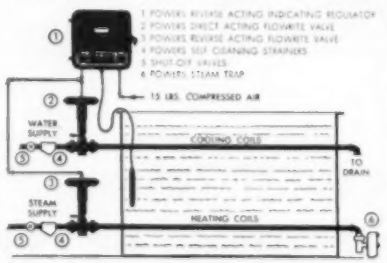
1. A slow rate of plating
2. Milky deposits
3. A decrease in tensile strength
4. A decrease in deposit density
5. Cracked deposits
6. Dark deposits



1 POWERS No. 11MF Self-Operating TEMPERATURE INDICATING REGULATOR


2 Steam or water supply
3 Rubber hose insulators
4 Powers self cleaning strainer
5 Quick warm up valve
6 Powers steam trap
7 Coils
8 Plastic covered bulb & tubing

COMPRESSED AIR OPERATED CONTROLS FOR PRECISE CONTROL OF HEATING and COOLING



In plating tanks, washers, heat exchangers, degreasers, Powers Temperature Controls more than pay for themselves. They save by stopping costly *over* or *under* heating.

Regardless of the size of your plating operation, there's a Powers Temperature Control precisely suited to your needs.

(c27)

THE POWERS REGULATOR COMPANY
SKOKIE, ILLINOIS • OFFICES IN CHIEF CITIES IN U.S.A. AND CANADA • SEE YOUR PHONE BOOK

THE POWERS REGULATOR COMPANY, 3400 Oakton Street, Skokie, Illinois

☐ Please send Bulletin 330 and Prices on Powers No. 11-MF Temperature Regulator for _____ (Print name of process or type of plating)

☐ Send Bulletin and Prices on Temperature Control for: ☐ Heat Exchangers ☐ Washers ☐ Degreasers

Name _____ Title _____

Company _____

Address _____

Vac-U-Max has no electrical connections, no motor, no bearings or moving parts. It uses only 25 cu ft/min of free air.

Vac-U-Max is sturdy, light weight, all steel construction, and is readily portable on free-moving rubber wheels. Its capacity is 20 gallons. Over-all size is 33 in high and 24 in diameter. It is produced by J. P. Glasby Mfg. Co. of Belleville, N. J.

E—140. Diamond Compound—An improvement in the formulation of a Diamond Lapping Compound is reported 1.7 times, by actual test, as economical as diamond powder. This is made possible by the development of a water dispersible vehicle which has increased the "adhesion" of the compound to the work piece; this is especially necessary when fast rotation laps are employed.

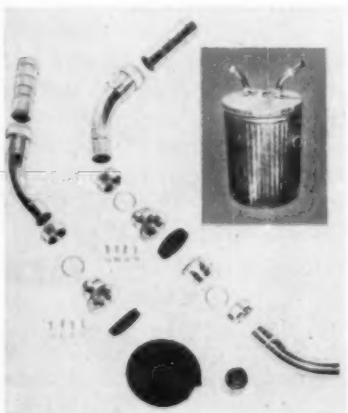
Immediate advantage of this increased economy is available to plants employing lapping and polishing operations on carbide, sapphire, steel and other hard materials, as well as to concerns performing precision grinding and plastic mold polishing.

Another unique feature of this compound is its ability to disperse in water. Industrial plants report that by using the diamond compound their work is cleared thoroughly by application of water for occasional inspection during and at completion of their lapping, polishing or cutting operations. They are finding, too, that with the new compound they can more easily salvage the used diamond powder.

E—141. Tank Kit—Production of an auxiliary tank kit, designed to provide additional wet or dry tank capacity for heavy volume vacuum cleaning work, has been announced by the Premier Company, St. Paul, Minn.

Industrial firms with major scrap pick-up problems can save labor and material expense by utilizing the increased capacity allowed by the auxiliary tank.

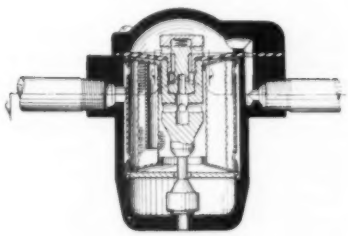
For Auxiliary Tank



The kit includes all attachments necessary to convert a standard 30 gallon waste can into an auxiliary tank. This tank is connected ahead of the vacuum machine.

Included in the kit is a hose adapter, swivel attachment nut and ring, curved tube, curved swivel tube, gaskets, bolts and nuts.

E—142. Automatic Air Filter—An entirely new, light weight, fully automatic and self-adjusting air filter designed for industrial use has been announced by the EMCO Pneumatic Corp., Des Moines, Iowa. It is called the "EMCO JET" Air Filter. The new, compact, completely automatic unit weighs only 12 ounces. The major parts are made of light weight aluminum and require no manual adjustment. The internal mechanism in the new unit has been radically improved.



Air Jet Filter

The EMCO JET L200-A eliminates sludge, abrasive substances, rust, scale and moisture from entering air operated tools, thus preventing deterioration of "O" rings and other vital parts. Aluminum parts are treated with a chromate coating to surpass a 100 hour salt water spray test.

E—143. Wear-Resistant Spots—According to engineers at Carboloy Department of General Electric Company, Detroit, wear spots which develop in machinery become a serious problem due to interference with continuous production. Location and spacing, often critically calibrated, can be maintained only with the use of a material which has the quality of extremely high wear resistance.

One solution to the problem, Carboloy engineers point out, is to consider cemented carbides as a component to resist wear at those critical spots. Strategically placed, they say, such carbide components or inserts will often add immeasurably to the economic value of high speed production equipment.

Probably the best known properties of carbides are hardness and resistance to wear and abrasion. Hardness depends upon composition and structure, and may vary from Rockwell A 84 for coarse-grained high binder materials to Rockwell A 93 for fine-grained low binder materials. A coarse-grained high binder carbide, Carboloy engineers explained, contains as much as 25 per cent cobalt binder.

Li'l Stopper

E—144. Miniature Automatic Shut-Off—Reproducible, precisely-timed operations (grinding, mixing, drying, shaking) are so important to modern analysis that electric shut-off timers have become standard on much of the larger, more expensive apparatus. Now, Fisher Scientific makes it easy to equip even the smallest, least expensive shaker or centrifuge in this manner.

The rugged little Fisher Electro-Stopswitch is 4 in x 4 in x 4 in. It is designed specifically for laboratories and is available in 60-minute and 24-hour models (each, of course, can be used for any fraction of these maximum periods).

After use with one instrument, the Electro-Stopswitch is quickly used with the next instrument—none of the expense of furnishing each appliance with an individual timer. The user merely makes electrical connection to the heavy-duty receptacle in the rear of the Electro-Stopswitch, and sets the desired operating period on the timer knob. When the cycle is over, the timer turns off the apparatus (and its own pilot light).

...HERE'S HOW YOU CAN INSURE MAXIMUM PROTECTIVE VALUES FOR MASS PRODUCED PLATED ITEMS...

From raw materials through the demands of mass production, Promat Protective Materials serve you *all* the way—to make production *easier*, protection positive, and beauty *serviceable*.

CLEAN at low acid concentrations — PROMAT ACID ADDITIVES act as depolarizing agents. Speed the action, insure uniform attack. Inhibit oxide formation during precleaning.

BRIGHTEN economically — PROMAT PROCESSES for zinc, cadmium, copper, white and yellow brass electrodeposits. Economical, expedient, geared to operate at highest current densities in mass production.

PROTECT with uniformity — THE PROMAT PROSEALS. Lasting decorative and protective conversion coatings for cadmium, zinc and copper electrodeposits; alloys of copper, aluminum and zinc. In Bright, Bronze and O.D. phases.

Write for details on any of the products mentioned and remember . . .

PROMAT MEANS PROTECTIVE MATERIALS

PROMAT Division

POOR & COMPANY
851 S. Market Street
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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 132.

EQUIPMENT & SUPPLIES

E—145. Pliable Platers Putty—Anderson's Plastics Company, Natick, Mass., now offers two types of Platers Putty to the plating industry. They are particularly useful in hard chrome plating as they are resistant to chromic acid as well as other acids, alkalis and salts.

Platers putty formula No. 5 is an excellent stop-off for threaded holes and other cavities. It can be used to cover or cap nuts, screws and gear teeth. It is a plastic solid that can be softened by kneading with the hands and has a dry surface.

Platers putty formula L is a stop-off in the form of a heavy bodied oil which has the same resistance to acids and alkalis as formula No. 5 but is easier to apply by dipping or by brush. The surface of the putty can be set or dried by immersion in hot water or other means of heat (200° to 250°) for a few minutes.

Neither formula No. 5 or L will dry out or harden even if left in the open. They can be used as described above or if a more permanent cap or rack coating is desired, the heat must be increased to 300 to 350° F for 15 to 20 minutes. Surplus putty can be cleaned off with naphtha.

E—146. HCl Absorbers—Pictured are two Camac Karbate falling film HCl absorbers designed for laboratory and pilot plant applications. Units are available in capacities of 15, 30 and 45 lb/hr of HCl gas. Matching scrubbing towers and piping connections are available if required.

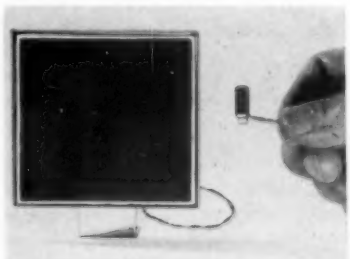
Heads are made of Furacam plastic, falling film cooling tube is of Karbate and cooling water jacket is steel. A special packing arrangement is employed to allow easy tube replacement and cleaning. Design provides for delivery of cool stable acid up to 22° Be concentration.

HCl Cleaners

E—147. No More Spotting, No More Tarnish—The Chemical Corporation of Springfield, Massachusetts has added Luster-On NS to its line. This product is claimed to be the answer to "spotting-out" troubles on thin copper and brass plate, especially under humid conditions. Also, suggested where porous castings are difficult to rinse. Prevents tarnishing and eliminates finger printing in assembly operations. Improves adhesion, provides leveling action, saves lacquer.

E—148. Solar Power—A new series of selenium Sun Battery Cells is now available from International Rectifier Corporation. The low cost and high self-generated output of these cells make them ideal components for transistor power supplies, control applications, photometric equipment, as well as experimental uses.

These Sun Battery Cells are now in production in a wide range of sizes and power ratings—from 0.14 sq in to 10.5 sq in in photosensitive area and from 0.1 milliwatts to 15 milliwatts power output in direct sunlight. A single stage transistor and germanium diode radio can be



Power from Old Sol

powered by International's Type B2M "Sun Battery" having an area of 0.32 sq in. Also, by connecting these cells in series-parallel combination, covering an area of

Millions of toys parade through Ideal Toy plant

INCREASED PRODUCTION THROUGH FAST, SIMPLIFIED CLEANING

Sel-Rex **FILTERS**

FOR LIQUID CLARIFICATION OR SOLIDS RECOVERY

"The fact that it takes 15 minutes or less to clean our Sel-Rex Filter has helped us increase production appreciably, in our electroforming operation. We spend more time filtering — less time cleaning," says Mr. A. R. Miller, chief chemist, Ideal Toy Company. "Another cost-cutting advantage is the use of unskilled help, thanks to the unique color-coded valves."

Ideal Toy Company is one of many Sel-Rex Filter users who enjoy the fruits of expert filter engineering know-how. If your manufacturing operation entails solids recovery or liquid clarification, it will pay you to investigate Sel-Rex Filters—the fastest cleaning filters on the market.

Sel-Rex Double Duty Filters use either a new stainless steel mesh element or POROUS STONE membrane. The entire element is secured to the tank cover—lifts out freely and easily for cleaning, by hand or with a hand-operated davit mounted on the shell on larger models. Messy handling of wet and dirty elements is eliminated—you can even clean an element used for carbon treatment without soiling your hands.

Standard portable, mobile and stationary models from 250 to 18,000 GPH capacity. Larger models built to specifications. Cut filtering costs — send for technical literature today.

BART-MESSING CORPORATION

Dept. PL-1 229 Main Street, Belleville 9, N. J.
Newark Detroit Los Angeles

The Power Supply of Tomorrow–Here Today

RAPID GERMANIUM RECTIFIERS

EFFICIENT • COMPACT • SEALED JUNCTIONS • LONG LIVED

The features of new Rapid GERMANIUM Rectifiers are proving to be the answer to many of the plating industry's power problems. More than any other DC power supply, Rapid GERMANIUM Rectifiers answer the need for —

EFFICIENCY — 95% at full load

VOLTAGE STABILIZATION — ±1 volt from no load to full load

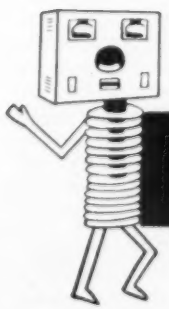
COMPACTNESS — require much less space than conventional units

SEALED JUNCTIONS — corrosion is kept out

PRECISE CONTROLS — oil immersed, fully motorized Inductrol controls, provide continuously variable control at the touch of a button

LONG-LIFE — no aging or change in characteristics even after accelerated full load tests

Find out more about RAPID GERMANIUM RECTIFIERS, "the power supplies of tomorrow — here today". Write to Rapid Electric Co., 2881 Middletown Road, New York 61, New York. Ask for Bulletin —.



THE NAME THAT MEANS *"More Power to You!"*

RAPID ELECTRIC COMPANY

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8 in sq, enough power can be generated in direct sunlight to drive a typical 5 stage transistorized radio or other transistor devices.

High self-generated output power is featured in these new sun battery cells. Short circuit current up to 40 ma or open circuit voltages up to 0.5 volts per cell can be generated in direct sunlight.

E—149. Automation for Barrel Plating—Separate, automatic plating-cycle control, in production barrel plating plants, for each tank, is achieved with a new control unit announced by August R. Hoffman, president of the Hoffman Control Co., Cleveland, Ohio.

The new control, when installed in plating plants for test run performance, proved a definite savings in time and material; faster smoother production operation; greater safety and improved plant operating efficiency.

A control box having two signal lights and an automatic cut-off time switch make up the new system. It is an improvement over previous models because it is more compact, lighter in weight and much lower in cost.

Installation is made easily and quickly by removing the cathode bar from each tank and replacing it with the Hoffman control box. The cut-off time switch may be mounted on the front of each tank or near it to suit the convenience of the operator.

The operator starts the current flow and the plating cycle by pre-setting the time on the switch dial. During the plating cycle the green light on the control box is on. It goes off upon completion of the cycle and the red signal light goes on. The red light signals the end of the plating cycle and shows that the current has automatically been cut-off.

Hoffman controls permit the safe removal of each tank barrel without danger of arc-started hydrogen gas explosions. Since the current can be turned off at will, on each tank, burning and unnecessary corrosion of barrel contacting points and the splashing of electrolytic solutions no longer occur.

G-E Rectifier Department to Build New Plant—A General Electric Company plant costing in excess of $5,000,000 will be built at Lynchburg, Va., as the new home for the company's Rectifier Department, now located at Lynn, Mass., and at Limerick, Maine.

Max I. Alimansky, general manager of the department, announced that grading of the plant site will begin in November, and actual construction of the plant will start in March, 1956. Initial production is scheduled for January, 1957.

He said the plant will eventually employ about 800 persons, more than 600 of whom will be hired from the local area.

The plant will occupy a 100-acre site located about 2 miles southeast of the Lynchburg city limits, adjacent to the main line of the Southern Railroad. It will consist of a one-story manufacturing building and an adjoining two-story office structure, which, together, will provide in excess of 200,000 square feet of floor space. Approximately 13,500 square feet will be devoted to modern laboratory and research facilities. The plant-site will provide adequate parking space for employees and is sufficient to permit expansion of the plant as its business requires.

UNIVAC is a Necessity—A new Electronic Data Processing System using UNIVAC as its central electronic file computer will be installed in the Executive Office building of The Carborundum Company, Niagara Falls, N. Y., according to an announcement by General Clinton F. Robinson, president of the company.

At first it will service the data processing needs of Carborundum's plants and sales offices in the United States. Plans call for it to eventually service all 12 divisions and subsidiaries of the Company in the U. S. and Canada and perform limited service for Carborundum's 13 plants outside the North American continent.

Robinson said that paper work tends to grow faster than the rate of company growth. Reports tend to be slower, more costly and less useful. "Slow reporting may be all right for hindsight but it is not effective for foresight which is the key to good management. Carborundum's new Electronic Data Processing System is our answer to this problem," he said.

meet our star salesman

Our best "door-opener" and "contract-closer" is the product itself. On its merits it has built us a "blue chip" customer list.

Why not see for yourself how good BFC Chromic Acid really is by sending us an order to cover your next spot need?

BETTER FINISHES & COATINGS, INC.

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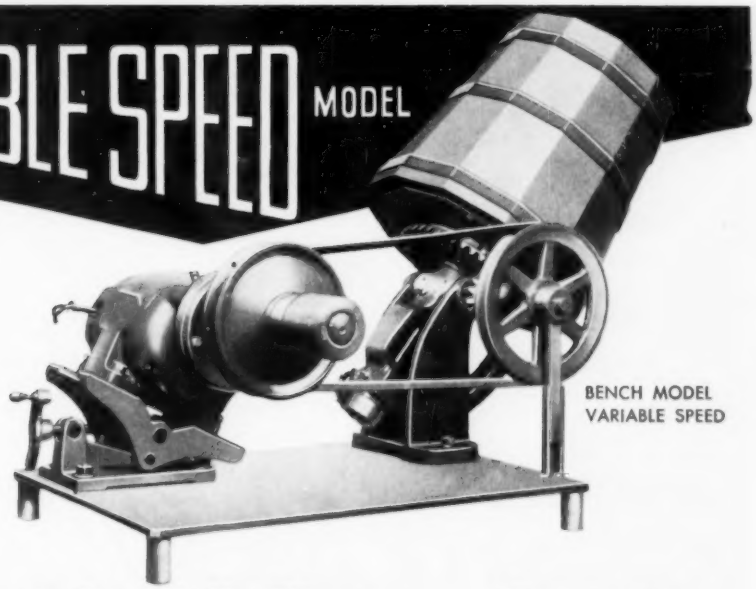
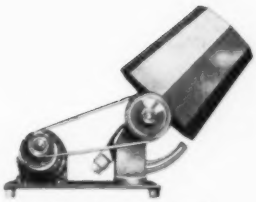
INVESTIGATE THIS TIME-SAVING

VARIABLE SPEED MODEL



BENCH MODEL
VARIABLE SPEED



Bench-Type Single Speed

No. 5—Single Speed

No. 5—Variable Speed

Note Carefully These IMPORTANT POINTS

Barrels can be filled with parts or abrasive—*while running.*

Work can be watched — samples removed for inspection — *while running.*

Angle can be changed for best abrasive or polishing action — *while running.*

Barrels can be emptied by tilting to pouring position — *while running.*

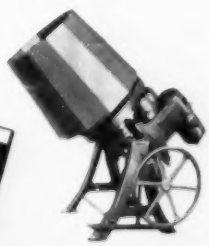
Barrels are made in various sizes, shapes, and materials. They are easily replaced.

No. 5A—Single Speed

No. 5A—Variable Speed

No. 6—Single Speed

If You're a Tumbler, Send for This NEW CATALOG



No. 6—Variable Speed

THE HENDERSON BROS. COMPANY

"The Tumbling Barrel People"

135 SOUTH LEONARD STREET
WATERBURY, CONNECTICUT

SINCE 1880 . . DESIGNERS AND BUILDERS OF TUMBLING BARREL EQUIPMENT

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 136.

COVER STORY

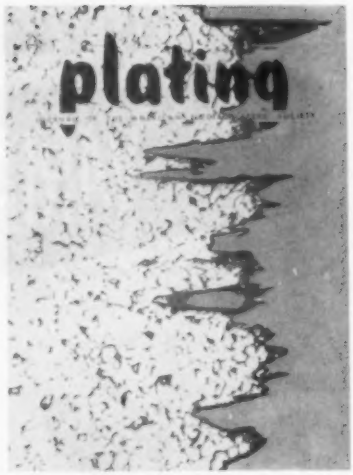
SCRATCH PATTERN

In the study of metallographic sections, a great many ingenious methods have been used. In the study of an alloy, for example, if a cross section of the metal sample is highly polished and etched and studied under a microscope, much insight is gained into the distribution of the various crystalline parts of each component metal.

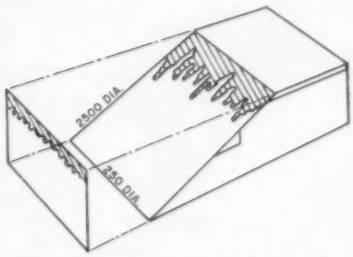
This same technique has been used to probe the characteristics of the plate, the interface and the basis metal. Again many ingenious devices have been invented among which is the imbedding of the sample in a colorless, transparent plastic to avoid the possible tearing away of the plate from the sample. In order to keep a thorough picture of the relationship of the coating to the substrate, these samples are usually cut at right angles. This affords a dependable end view.

R. W. Redmond uses a method by which the surface scratches can be exaggerated and still measured (see page 81). By the simple expedient of plating nickel onto the sample of polished steel and cutting the end view at a 45° angle instead of a 90° angle, the vertical scratch depth is increased by ten times. This expedient permits a more accurate evaluation of the interface surface and allows for finer and finer and more precise, more controlled prefinishing by abrasive methods.

On the cover, there appears the rough 60 microinch, scratch pattern. Although the treatment has embellished the original, the extra enlargement brings out the fine



details of the photomicrograph. The intriguing design adds to its appeal, but the completely surrounded island of nickel just below center is perplexing at first blush. Only after reconsideration and remembrance of the 45° cut does understanding return.



We are indebted to R. W. Redmond for permission to use the photomicrograph on the cover. Such an illustration bespeaks the whole vast field of precise scientific investigation which characterizes the modern approach to the subject. Here is a suggestion of accurate control. Here is a picturization of the problems of epitaxy. Here is an intelligent approach to the problems of studying the character and depth of abrasive finish.

(The Editor)

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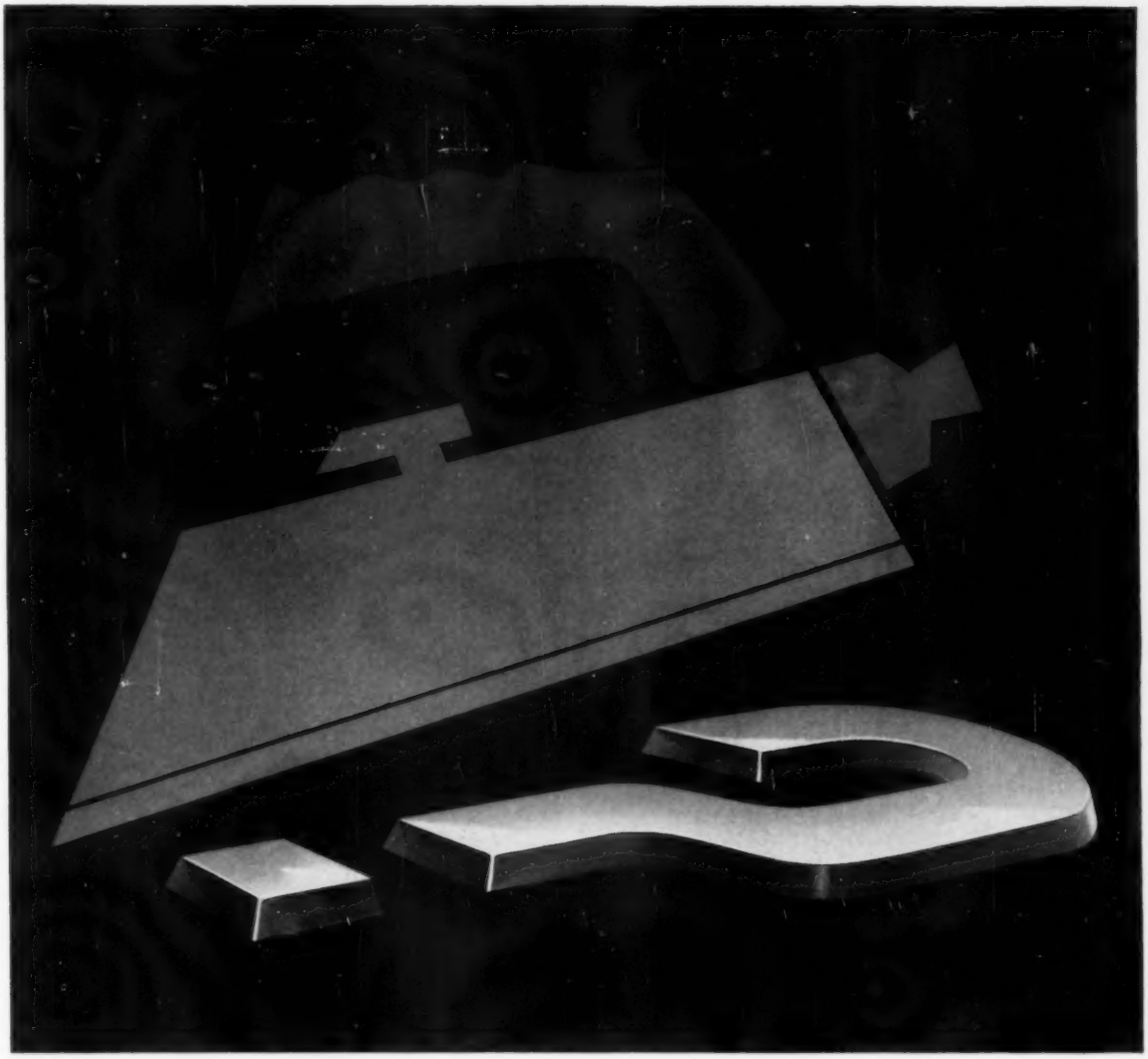

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NICKEL STORY

DEAR SIRS:

You will recall that I agreed to discuss the points brought up by Dr. Graham. Accordingly, contained herein are my views thereon.

The paper discusses the definition of the plating industry and gives the impression that the Government has defined the plating industry as 15 per cent to 20 per cent of those engaged in plating, that is, the contract plating shops. In this connection may I say that I know of no such definition. In dealing with those engaged in electroplating the Government does not differentiate between so-called captive departments of manufacturing concerns and contract plating shops.

The paper states that the plating industry has inherited the inequity of distribution of the Korean period. This is not the case. As indicated in my discussion of this subject, there has been accomplished an adjustment which gives the plating industry an equitable share as compared with other industries, to compensate for the removal of end use restrictions which were enforced during the period of controls on plating and other industries. The plating industry does not now receive a lower percentage of base period quantities than other end use industries for nondefense uses.

It is stated that the plating industries are the only ones paying premium prices for nickel and that the metallurgical industries are not obliged to do so. This again is not the case. The inequitable supply of nickel for industrial uses makes it necessary for all industrial groups to acquire a portion of their supply at premium prices. The origin of this nickel as indicated in my discussion of this subject is principally France, Germany and Japan as well as nickel originating in scrap. There has been some nickel improperly obtained by the misuse of defense ratings. These cases are currently under investigation and documentation is being prepared for forwarding to the Department of Justice.

The paper speculates on substitution possibilities in the metallurgical industries and suggests German success in this field as a case in point. According to our information the metallurgical industries are practicing wide scale conservation measures in order to stretch available supplies of nickel to the maximum. It is, of course, impossible for the Government to suggest that German or any other standards be used in the metallurgical industries, the electroplating industries or in other industries. I have complete confidence that U. S. industries will meet the needs of U. S. markets in a manner more consistent with the needs of our own industrial practices.

The paper states that decisions involving the amount of nickel which the plating industry received was determined within the Iron and Steel Division of the War Production Board, NPA, and the Department of Commerce. This is not the case. Final decisions with respect to the distribution of nickel were not made in the Iron and Steel Division but rather were made and directed by the Assistant Administrator for Policy by delegation of authority from the Administrator. It has always been a hard and fast rule that final decisions in such matters as the distribution of materials are directed from the policy level rather than the commodity level of Government.

The paper states that the International Nickel Company is currently handling nickel allocations. In this respect the International Nickel Company is one of 5 suppliers. The distribution of nickel by these five suppliers is audited on a regular and voluntary basis by the Government for the purpose of assuring an equitable distribution of available nickel supplies.

Sincerely yours,

Herman B. Director
Staff Advisor
Industrial Raw Materials
and Stockpile

(See Mr. Director's discussion on page 98 . . . Ed)

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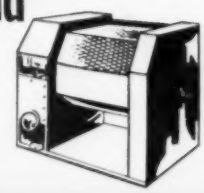

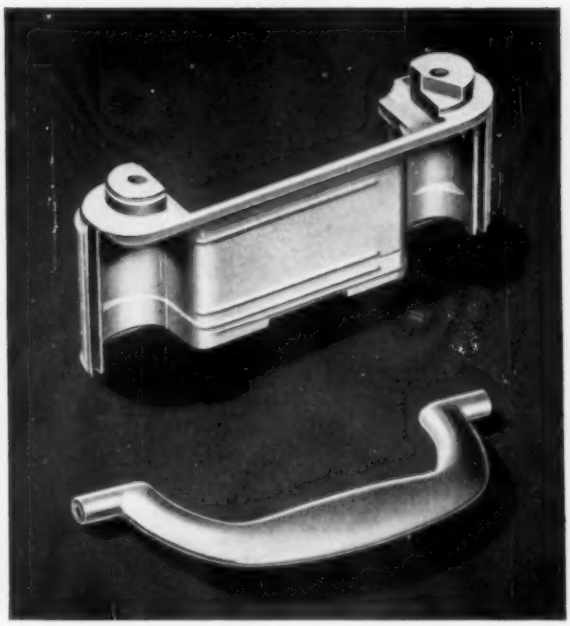

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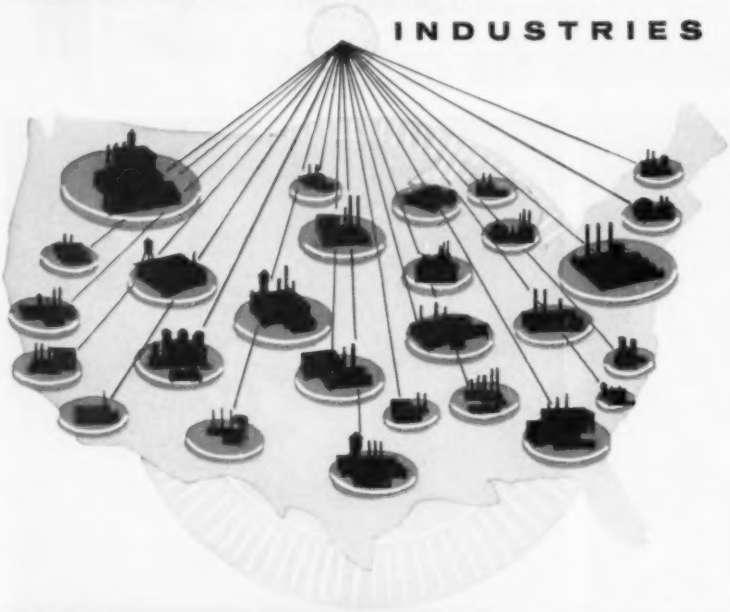

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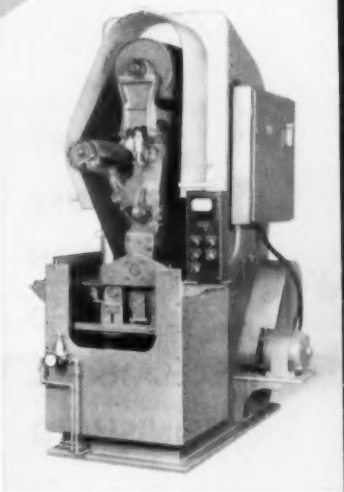

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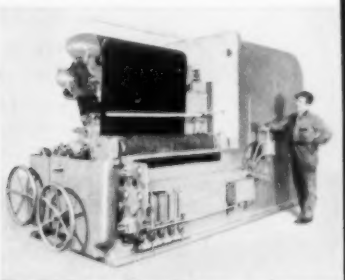

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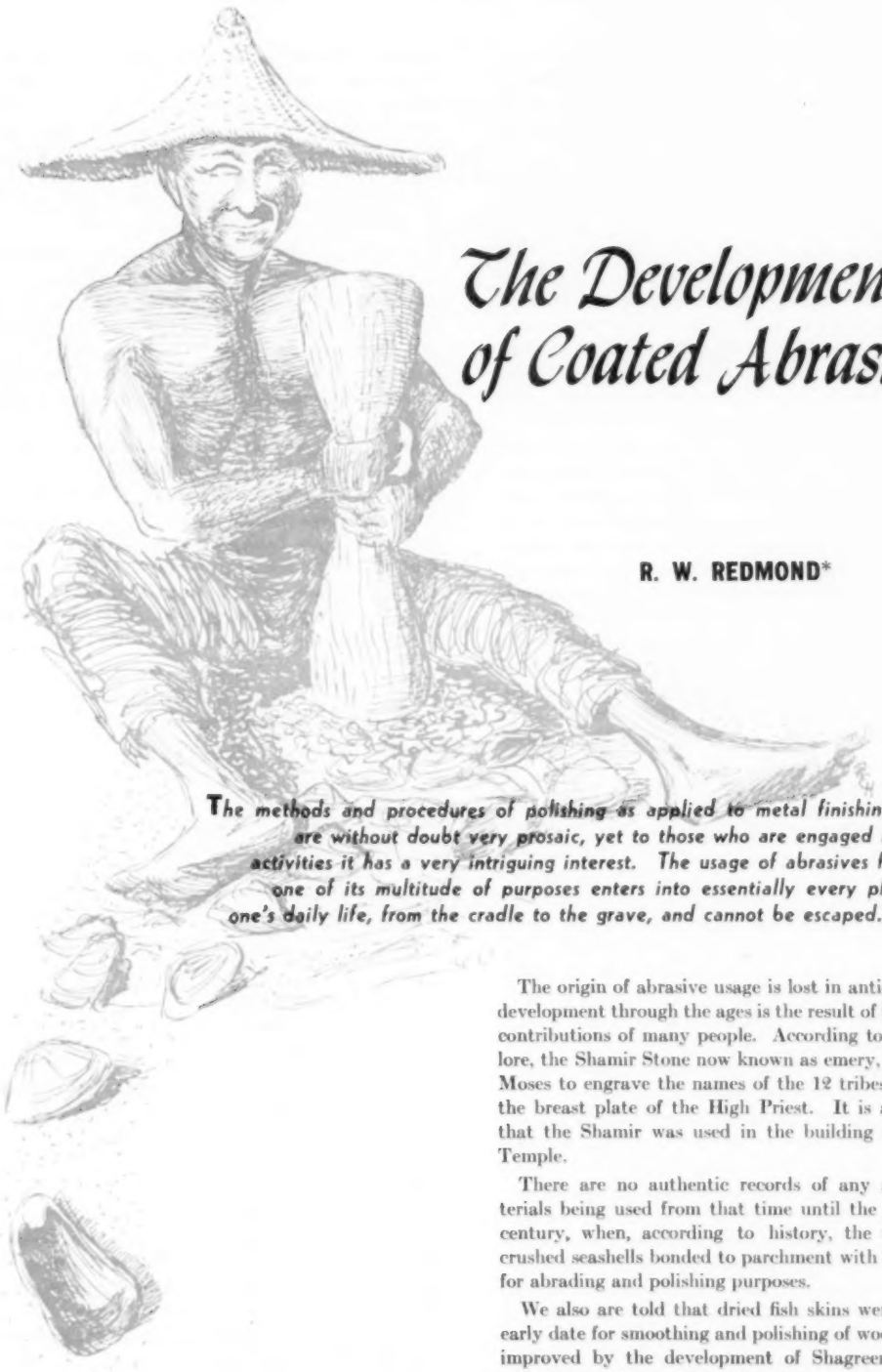
WHY FEATURE ABRASION AND MECHANICAL FINISHING

Primitive man knew that he could produce a finish on metal by rubbing it with various abrasive substances. Down through the ages, metals have been "finished" by numerous variations on the same basic process of "rubbing." Still, these are processes which are only now beginning to be understood. That is, the resultant surface changes brought about by abrasion. The literature is remarkably void of material on this subject. ▲▲▲In electroplating, a special set of conditions must be coped with. The recent advances made in the understanding of the surface lattice-habit of the basis metal are only just enough to indicate that there is more here than has been suspected in the past. The lattice refers to the cage-like skeletal structure formed by the joining together of the various atoms of the metal. The manner in which this cage usually forms is called the lattice-habit. It is the fear of upsetting this lattice-habit which has prompted metallurgists in the past to warn electroplaters away from mechanical preparation of the basis metal. ▲▲▲There has been much to substantiate this fear. Little is known of the actual epitaxial relationship between the coating and the basis metal. Epitaxy refers to the structure of the basis material reproduced in a coating. Experimentally, the grain structure in the base metal has been continued into the electrodeposit. However, this is not easily accomplished nor have we reached a point where we can define the conditions under which this ideal state can be assured. A substantial deformation caused in the crystal lattice on the surface will naturally have a weakening effect on the adhesion strength of the coating. Abrasive methods and other mechanical procedures have been suspected constantly of so deforming the surface that electrodeposition becomes a hazardous matter. Lack of adhesion is frequently traced by many to the internal stresses set up on the surface by such methods of prefinishing. These gnawing questions plague the electroplating industry. ▲▲▲The AES, in recognition of the need to understand the metallography of the basis metal and its effect on electroplating, has a research project at work on the subject. (Project No. 14 at the Ontario Research Foundation.) ▲▲▲Slowly, knowledge of this matter is being incorporated into the literature. The most recent and perhaps the clearest statement of these facts is the material included in *Electroplating Engineering Handbook* by Dr. Harold J. Read in Chapters 3 and 14. The rest of the knowledge that must be gained is still being learned in the laboratories. ▲▲▲On the other hand, mechanical finishing methods have made long strides forward toward the improvement of the surface, be it preparation for plating or the finishing of the plated surface itself. In an effort to bring together into one place as much of this information as possible, the staff of PLATING has prepared this feature issue on the subject. It would be folly to believe that everything known of the subject could be included here, but an attempt is made to inform. The best practical men in the field have been asked to contribute articles as have some gentlemen who choose to approach the matter from an abstract point of view. (This latter has been deemphasized, however, in the hope that method and reasons would be of greater immediate help than theory and speculation.) ▲▲▲The inescapable fact is that the preparation of metal surfaces is swiftly and efficiently accomplished by mechanical means. These have been improved and refined to a point where the interfacial relationship is as satisfactory as can be achieved with the knowledge we now have of epitaxy. ▲▲▲Even more to the point, however, is the activity and progress being made in the ultimate finishing of metal pieces. In this area of activity, barrel finishing has made the greatest strides. For this reason many of the articles deal with new methods and applications of barrel finishing. For instance, within the limits of this field many new and ingenious approaches have been developed in use of media, methods of operation, auxiliary equipment, fixtures, etc. ▲▲▲Taken all in all, the matter of mechanical finishing is fast proving its great value and becoming virtually indispensable from the point of view of economic operation as well as accuracy of finished products.

THE EDITOR



The Development of Coated Abrasives.

R. W. REDMOND*

The methods and procedures of polishing as applied to metal finishing, are without doubt very prosaic, yet to those who are engaged in these activities it has a very intriguing interest. The usage of abrasives for one of its multitude of purposes enters into essentially every phase of one's daily life, from the cradle to the grave, and cannot be escaped.

The origin of abrasive usage is lost in antiquity and its development through the ages is the result of the work and contributions of many people. According to Jewish folklore, the Shamir Stone now known as emery, was used by Moses to engrave the names of the 12 tribes of Israel on the breast plate of the High Priest. It is also recorded that the Shamir was used in the building of Solomon's Temple.

There are no authentic records of any abrasive materials being used from that time until the 13th or 14th century, when, according to history, the Chinese used crushed seashells bonded to parchment with natural gums for abrading and polishing purposes.

We also are told that dried fish skins were used at an early date for smoothing and polishing of wood. This was improved by the development of Shagreen, a material originally made from the skins of certain species of rough scale shark and later other skins into which granular material such as seeds were worked in to produce the characteristic roughness. It was used both as an abrasive and

* Engineering Consultant, Murray-Way Corp.

as an ornamental material depending upon the texture, and was in common use in the 16th century as shown by the introduction at that time into English language of the word "chagrin" from the French, meaning to vex or annoy.

Abrasive paper was sold in the streets of Paris in 1769. An old print of that date bears this out but it is not known how it was made. The first article we know of describing a method of making coated abrasives was published in 1808. Calcined and ground pumice was mixed with varnish and spread on paper with a brush. Emery cloth was invented in England by Lothrup in 1831. He used sand, powdered glass or emery mixed with glue and spread the mixture on cotton cloth. This was the only coated abrasive known at that time, and its use continued for many years. As a matter of fact, many people still refer to the more modern flint paper as glass paper.

Because of certain inherent faults of the crushed glass coatings, experiments were finally started with the crushing and coating of flint quartz, and a United States Patent was granted in 1835 to Fisher on a machine providing a method for the making of coated abrasives. Steam was allowed to act on the uncoated side of the paper to prevent curling. The sand was sprinkled from a sieve on the glue coated paper carried by an endless belt. In 1844 Fremy in France began the commercial manufacture of glass and emery paper with a machine of somewhat different design, on which he obtained a patent. In 1856 emery paper of greater degrees of fineness was manufactured in England. Powdered emery was blown into a chamber in which glue coated sheets were hung at various heights, the highest paper receiving the finest dust. In 1861 a German patent was granted on a flint abrasive paper.

Abrasives

Since these aforementioned dates, development work has been done in many countries and improvements have been introduced with increasing frequency. In the manufacture of commercial abrasives seven distinctively different abrasive materials are employed, each being suited to a particular type of application. These, in order of their respective hardness are flint, garnet, emery, aluminum oxide, silicon carbide, boron carbide and diamonds.

Flint, garnet, emery and diamonds are natural abrasives, mined from the earth and crushed into tiny fragments or grains of various sizes, before being ready for use by the abrasive manufacturer. The remaining three, aluminum oxide, silicon carbide and boron carbide are artificial abrasives, produced by fusion in an electric furnace. The respective hardnesses of artificially produced abrasives do not vary, whereas the hardnesses of natural abrasives do. This characteristic, coupled with the fact that they are harder than flint, garnet or emery, has placed the artificial abrasives (particularly aluminum oxide and silicon carbide) far out in front for commercial purposes.

While the hardness of aluminum oxide and silicon carbide remain strictly uniform, each can be processed into a number of forms having varied performance capacities. The manufacturers of abrasive products, as a matter of fact, use aluminum oxide in five different forms and silicon carbide in two forms. Nor does it follow that the hardness of a grinding wheel or a honing stone will not vary simply because the hardness of the grain with which it was made does not vary. The hardness of a solid abrasive tool is determined and controlled by the bond, or grain, which retains material in the tool as well as by pressure used in manufacturing it; not by the abrasive grain imbedded in it. This applies equally to coated products.

To understand better the scale of hardness between these various materials the MOHS Scale of Hardness is reproduced here. Although hardness may be defined as resistance to external pressure, it is clearer in this case to define hardness as the ability of the grain to penetrate the object being sanded or ground. Back in 1820, Friedrich Mohs, a German mineralogist, devised a system for grading the hardness of minerals. Under the Mohs Scale any substance which would scratch another substance was placed in the scale above the substance so scratched. Talc, being softest of all, was classified as number one. The diamond being the hardest, was classified as number ten. Although still used today as the basic scale of hardness, the Mohs Scale is not sufficiently precise to meet today's scientific requirements. The scale, as devised by Mohs and supplemented by other minerals and artificial abrasives is noted as follows:

Mohs Scale of Hardness

Talc	1.0
Gypsum	2.0
Calcite	3.0
Flourite	4.0
Apaite	5.0
Orthoclose	6.0
Quartz (Flint)	6.8-7.0
Garnet (Topaz)	7.5-8.5
Emery	8.5-9.0
Corundum	9.0
Aluminum Oxide*	9.4
Silicon Carbide*	9.6
Boron Carbide*	9.7
Diamond	10.0

** Abrasives so marked are artificial, others are natural minerals.*

Researchers state the hardness gap between 9.7 and 10 is greater than that between 9.7 and 1.0.

In addition to hardness, abrasive grains have other important characteristics with which the commercial user must be concerned. The most important of these (after hardness) are:

1. Toughness How much abuse will it stand? What is its shear strength? Its tensile strength? How easy will it fracture?

2. Fracture How does it fracture? What is the shape of the grain after being crushed? Is it long or short, round or pointed, sharp or dull?

All of these properties—hardness, toughness, and fracture—are extremely important when attempting to deter-

mine the proper and most efficient type of grain for any given grinding or sanding task. The grain so selected, should be *hard* enough to penetrate the material being abraded. It should be *tough* enough to withstand the stresses of grinding and sanding. It should have the capacity, when fractured, to continually present new, clean and sharp edges or fragments against the work.

Just as one abrasive grain is harder or softer than another, the degree of toughness and the cutting edges caused by fracture will vary from one grain to another. Aluminum oxide, for example, is slightly *softer* than silicon carbide, but it is a great deal *tougher*. Silicon carbide, although more *brittle* than aluminum oxide, fractures with much sharper wedges. Emery is *harder* and *tougher* than flint or garnet, and *tougher* than aluminum oxide or silicon carbide. But emery does not have the cutting capacity of *any* of them, because it fractures into round and blocky fragments. For a clearer comparison of these characteristics, refer to the following table:

Mineral	Hardness	Toughness*	Type of Fracture
Flint	6.8-7.0	20%	Light Wedges
Garnet	7.5-8.5	60%	Light Dish Shaped Wedges
Emery	8.5-9.0	80%	Round & Blocky
Aluminum-Oxide	9.4	75%	Heavy Wedges
Silicon-Carbide	9.6	55%	Sharp Wedges & Slivery Points

** Means percentage of resistance to breakdown, under a given pressure.*

Flint Flint is the most common mineral used in coated abrasives—dull, greyish-white in appearance, and commonly known as just "sandpaper." Its usage is largely confined to painters, carpenters, and to the leather industry. Like any good abrasive, flint possesses the ability to fracture sharply.

Garnet The term "garnet" usually is associated with a dark red semi-precious stone that has been used for ornamental purposes since prehistoric times. In the middle ages, it was considered emblematic of constancy, and believed to possess the virtues of dispelling poisonous and infectious airs, of preserving health and of reconciling differences between friends. When worn from the neck, it was said to ward off plague and thunderbolts, to strengthen the heart and to increase riches and honor. Garnet came into the picture as an abrasive through the keen competition that developed in the attempt to produce an abrasive product superior to flint. It is ideally adapted to the sanding of wood, particularly since it has a better cutting surface or fracture. Through the tempering of garnet by heat, the grain is toughened beyond its natural state, greatly increasing its useful life. Even with this tempering process, however, garnet is seldom used on any except extremely soft metals.

Emery Emery is an impure granular variety of corundum. It is found in the U. S., Turkey and a few other parts of the world. After emery is mined, even the most careful refining cannot remove all of its impurities, one of its main components being oxide of iron. Emery is a member of the same family of which corundum, sapphire, and oriental ruby are members. It has approximately the same specific gravity as these minerals, but is dull, opaque, and not crystallized. Emery contains corundum to a widely and varying extent. Another main component is aluminum, although it contains less of this than either corundum or sapphire. Abrasive manufacturers limit their use almost exclusively to coated items. Emery is hard enough and tough enough to be an excellent abrasive, but this advantage is offset by its type of fracture. When crushed, its fragments are round and blocky.

Aluminum Oxide Aluminum oxide or rather crystal alumina is produced in an electric furnace by fusion and reduction of Bauxite. Bauxite is a clay-like aluminum hydroxide discovered originally in France. It contains the purest form of aluminum oxide ever found in a natural state in commercial quantities. Large natural deposits of bauxite are found in this country in Alabama, Arkansas and Georgia.

The fusing process under which crystal alumina is produced, was invented in 1897 by Charles B. Jacobs. After the bauxite is calcined to remove a large percentage of its water, it is mixed with ground coke and iron borings, and fed into a furnace around two carbon electros. Under a temperature of approximately 3000° F the bauxite fuses. A two ton mass of the material requires 24 hours to heat and 36 hours to cool to a point where it may be removed from the furnace. During the cooling period the fused bauxite solidifies into a mass of crystalline material analyzed at approximately 96 per cent alumina. The remaining content is: Titanium Oxide, Silicon and Iron Oxide. The solidified mass is then crushed by jaw crushers and steel rolls into tiny granular fragments. Aluminum oxide grain, being tougher than silicon carbide and only slightly softer, is best suited to grind materials of high tensile strength, such as carbon, alloy, and high speed steels, stellite, tough bronze, and malable iron. Aluminum oxide crushes into wedges with heavy shoulders supporting the short edges. This, in large measure, accounts for its toughness. Aluminum oxide grain will withstand the shock of impact created by a belt traveling from 4,000 to

7,000 ft/min. Whereas, garnet or other softer grains will shatter and lose cutting ability rapidly.

Silicon Carbide Silicon carbide, like aluminum oxide, is a product of the electric furnace. It is, however, more difficult to fuse than aluminum oxide. It was first made in 1891 by Edward G. Atcheson. The principle ingredients are silicon oxide (glass sand) and carbon made from finely ground petroleum coke. Sawdust and common salt are added to the mixture, the former to make the mixture coarse and permit the escape of carbon monoxide gas, and the latter to remove impurities from the sand and coke. The mixture is subjected to a temperature of 4000° F for 36 hours, during which time vaporization is largely completed with a subsequent formation of silicon carbide crystals. At a temperature of 5000° F silicon carbide crystals will deposit into silicon vapor and graphite. Silicon carbide grain is sharper, more slivery, and harder than aluminum oxide, but not as tough. Because of this, it is best suited to grinding or sanding materials of low tensile strength such as cast iron, brass, bronze, aluminum and lead castings, stainless steels, wood, glass and plastics.

In the early days of silicon carbide it was first used for polishing precious stones and at that time sold for prices as high as $880 a pound. Improved production methods, however, have reduced the cost of this material where it is highly competitive with other abrasive grains.

Boron Carbide Boron carbide is an artificial abrasive electrically produced. Diamonds, hardest by far of all natural substances, are progressively harder than silicon carbide. In general, they are too costly at the present time, to have an extensive economic application in the abrasive industry. It should be noted, however, that the diamond wheel is used very extensively in dressing other types of wheels.

Backings

Types and Kinds of Backings The backings for surface abrasives can be classified under the following headings: paper, cloth, fiber, paper cloth combination, and cloth fiber combination.

Paper Backing Paper is used in coated abrasives in four weights, i.e. (A, C, D, & E.).

"A" weight paper is known in the trade as finishing paper because it is used, in the main, for finishing operations. This is the lightest of all paper used for sandpaper purposes. It is extremely flexible, soft, alpha-cellulose paper ideal for light pressure and sanding operations in which the operator must feel the roughness and imperfections beneath his hand. Because of its flexibility, "A" weight paper is best suited to sanding irregular surfaces, such as moldings, grooves and flutes. "C" and "D" weight papers, 70 and 90 pound weights respectively, are alpha-cellulose Fourdrinier papers, progressively heavier, less flexible, and stronger than "A" weight and known in the trade as cabinet papers. "C" and "D" coated abrasives are employed on hand sanding operations in which wheel pressure is necessary. Although less flexible than "A" weight paper, "C" and "D" weight papers have a considerable amount of flexibility. "E" weight paper, called rolled stock, is the heaviest and strongest of all abrasive papers. Because of its great tensile and shear strength, "E" weight or 130 pound paper is used on all machine sanding operations in which paper backed abrasives are employed. These include drum and belt sanding, many kinds of mechanical floor sanding jobs and other types of mechanical sanding in which sheets, rolls, disbands or sleeves are used.

Obviously, the weight and strength of the paper used for backing will determine the size of the grain used with it. On "A" weight paper, only very fine grain is used. The "C" and "D" weights take progressively coarser grain, while "E" weight paper will take almost any size grain.

Cloth Backing Cloth is used by abrasive manufacturers in three weights: "J" cloth, "X" cloth and "H" cloth.

"J" weight cloth, known as Jeans cloth, is light and flexible and used with finer size grain. Unlike light weight paper, it is used for both hand and machine sanding operations. Wherever extreme flexibility is required such as the sanding of contours, "J" cloth should be used.

"X" cloth, called drill, is a medium weight, strongly woven canvas and probably is the most popular cloth used for coated abrasive backing. Although flexible enough to be used on a limited number of irregular surface operations, "X" weight cloth is more commonly used on flat work where medium and heavy duty grinding is necessary—it being able to take most any grain size.

"H" cloth, or twills, is an extremely heavy cloth backing having great strength, but in the finished product providing little flexibility. Its use is generally limited to heavy grinding operations, with heavy stock removal, but with little consideration for either flexibility or finish.

Fiber Backing Vulcanized fiber, extra heavy, is employed mainly for operations calling for heavy stock removal, and requiring a disc with heavy, tough, but flexible backing. The coarser grains for the most part are used.

Paper Cloth Combination Paper cloth combinations, are usually "E" weight paper combined with very lightweight cloth. It is much stronger than "E" weight paper alone, and has more resistance to stretch than cloth alone.

Fiber Cloth Combinations The fiber cloth combinations is an extremely strong fiber laminated to drills ("X" weight), and is used mostly for disc operations.

Bonding

Basically, there are two broad classifications of coated abrasive products:

1. Water Soluble: a.—Glue Bond; b—Glue Filler Bond.

2. Waterproof: Various types of resins used, producing different degrees of hardness and flexibility.

In the glue bond, water soluble types, only the highest quality of animal hide glue is used. In the "glue-filler" type, the same kind of glue is used with usually an admixture of calcium carbonate which will modify the glue in such a manner that the final film is harder, more heat resistant and less affected by moisture than glues not so modified.

The waterproof bonding is used on both paper and cloth products, not only to hold the grain in position, but to waterproof both face and back of the product, and keep it from becoming spongy.

Grain Sizes

Generally speaking, coated abrasives are made from grain sizes from the extremely coarse No. 8 to superfine No. 600. The numerals indicate the grain will pass through a vibrating screen, having that many openings to the linear inch, but no finer meshed screen. Screen openings usually conform to the following range: 8, 10, 12, 16, 20, 24, 30, 36, 40, 50, 60, 80, 100, 120, 150, 180, 220, 240, 280, 320, 400, 500 and 600.

All grain sizes coarser than No. 240 are rigidly checked by the silk screen method. Sizes finer are checked by sedimentation or by micro-projection system.

Grain Coating

Grain coating is the manner in which the abrasive grain is spread over the backing material. Essentially there are but two modifications: Closed coating and open coating.

Closed coating is the standard type wherein the grain is spread evenly over the backing, grit close together, thus providing an unbroken array of tiny cutting points over the entire face of the backing.

With open coating, as the name implies, the grain is spaced over the face of the backing, leaving small openings between each grain and those adjacent to it. This type of coating is extensively used to abrade soft materials. The backing material being only 50–70 per cent covered with grain, has more flexibility than the close coated material of the same weight.

Flexing

The flexing of coated abrasive products involves the breaking of the bond bed, for the purpose of easier application to the product, to the machine, and the work to be done. The two types of flexibility being 90° and 45°. When the flexing runs across the sheet, it is said to be 90°, and this type is used mostly on flat belt work. With the 45° flex, the product is flexible in all directions, and readily adapted to irregular shapes or contours.

Flexibility in coated abrasives is at times achieved with some sacrifice in the use mileage of the product. For this reason, minimum flexibility consistent with work requirements should be selected.

It should not be assumed that bonded abrasive companies are static in their efforts. Not only do they seek to improve their products, but intensive studies are and have been in progress for some time, covering such functions, i.e.:

1. Stroboscopic Camera Studies, covering

a. Single Grain Operation.
   1. Metal removal or cutting.
   2. Temperature developed.
   3. Wear or shattering.
   4. Effects on bonding and sizing.
   5. Maintenance of cutting ability.

b. Multiple or Full Grained Surfaces.

c. Coolants and their effects.

2. Temperature Produced.

a. Relation to coolants.
b. Amounts of bonding and sizing.
c. Effects with different backings.
d. Effects with different abrasives.
e. Effects and amounts at point of metal contact.
f. Relation to grain wear.
g. Depth of cuts.

3. Development of measures of performance.

4. Electronic and optical microscopic studies of contour wear patterns of grains.

Wherever such studies will lead, the results obtainable, and the development of new yardsticks of performance, will without question, provide an ever renewing field of activity and interest, with an unknown future. The users of abrasive products will be the beneficiaries of these programs.

Considerable effort has been placed on the coated abrasive for the one purpose of bringing about a better understanding that these products are tools, not just something to scrub a surface with. An examination with a suitable microscope will reveal the fact that removed metal is in the form of minute chips or curls, typical of machining operations. In the metal finishing industry, the problem of improving appearance in quality of the finished product (while at the same time lowering production costs) is one that has plagued fabricators for many years. The problem is particularly acute where finished metals are used for smart decorative effects. The finishing of these metals, poses a definite challenge in quality and lower manufacturing costs; for the sales value of an attractive finish cannot be questioned.

C4

PART 23228

Barrel Finish Burr - Polish

OPER 20

6/1/54 15

PCS/HR	MIN./C	DATE	DEPT.	MACH. NO.	MACHINE	LUBE	MATERIAL

ELEMENTS	FEED	RPM	DEC. MIN. PER PC.	OCCUR
Barrel No. RPM 9				
Chips: Type Super Honite Size #3 Lbs. % Load 60%				
Work Load: Lbs. Pcs.				
Compound: Type Multi-Burnish Lbs. 3 (Tote Pan)				
Water Level, inches 2 inches above load				
Running Time: Hours 4, Minutes				
SECOND RUN: none				
Rinse				
Compound: Type Lbs.				
Water Level, inches				
Running Time: Hours, Minutes				
SEPARATION:				
Hand X				
Machine Shake through screen: Chips X (or) parts				
Screen size:				
SPECIAL HANDLING:				
Treat with care. Do not dump. Place parts in basket.				

A specific record of each test run, and subsequently the final production run, aids the barrel finisher in obtaining the same finish run after run. This type of record also helps greatly in conducting trial runs on similar parts

BARREL FINISHING . . . *a precision tool*

By W. P. NUNN*

There's a world of difference between a feudal courtyard and modern plating shop—but this unlikely pair does have something in common.

Barrel finishing, a system of refining a metal surface, was as important to the armorer in the fourteenth century as it is to today's plating specialist.

As practiced today, barrel finishing is a science which economically can produce precision surfaces on thousands of parts in a single operation, giving each part a uniform finish.

In one instance a manufacturer of valve parts only 0.010 in thick is generating a radius of 0.002 in on all edges by using up-to-date barrel finishing techniques. There are 1,600 of the parts in each barrel load; yet, there is no distortion. Production cost amounts to $0.0015 each.

Another manufacturer who modernized his barrel finishing techniques has completely eliminated a secondary cleaning or coloring operation by using a new type of compound, and parts are being copper-nickel-chrome plated right from the barrel after a single run.

This is in sharp contrast to the armorer, who smoothed the rough edges and surfaces of armored suit components by placing them in barrels partially loaded with stone. For seven days, so the story goes, the barrels were rolled around the courtyard or across fields, until the armor was smooth—at least according to fourteenth century standards.

Modern barrels are usually octagonal, water-tight cylinders, 30 to 60 inches long and ranging in diameter from 24 to 36 inches. They are usually rubber-lined to provide a cushion for the parts being processed. Most barrel finishmachines are equipped with variable speed control, forward and reverse switches, and some type of brake.

The armorer's decision to use barrel finishing was a relatively simple one: just load the parts into the barrel with the stones and find enough labor to do the rolling.

The present day barrel finisher has more precise methods

This is a modern barrel finishing department operated by a shop-distributor in Chicago. Barrel line at left features water hoses and drainage facilities for each machine. At right are chip bins, labeled as to size and type of chip. Overhead conveyors move chips from bins to barrels

*"Honite" Field Engineer, Minnesota Mining and Manufacturing Co.

at his command—and a variety of "stones" (media) and compounds which can be combined with barrel speed and running time to produce almost any desired finish. The importance of media and compound selection is borne out by the previously mentioned case history in which a secondary cleaning run was eliminated.

That manufacturer had been using a four-hour cutting run followed by a three-hour burnishing run, using a different compound for each run and consuming a large amount of water for between-run washouts.

By adopting a natural stone media of a quartzite nature and a new surface treatment compound especially designed for use with zinc die castings,† the manufacturer:

Reduced the time cycle, freeing equipment for additional use . . .

Reduced water consumption, and subsequently eased a drainage problem . . .

Lowered direct labor costs due to the shorter run and elimination of washout time . . .

Discovered 100 per cent longer media life . . .

Substantially lowered compound costs . . .

Obtained improved surface finishes.

Results such as this are not achieved simply by "chucking stuff into a barrel." Careful experimentation with barrel finishing techniques, and a knowledge of media and compounds, are two basic components for a successful barrel finishing program.

MEDIA SELECTION

The most common media in use today is stone, more properly called "chips," and there are several types of these available—including natural stone, limestone, granite, natural bonded aluminum oxide and ceramic bonded aluminum oxide. As a rule, natural chips produce the best results on aluminum and zinc die castings, leaving them light in color and with very clean surfaces. This is also true on aluminum machined and stamped parts.

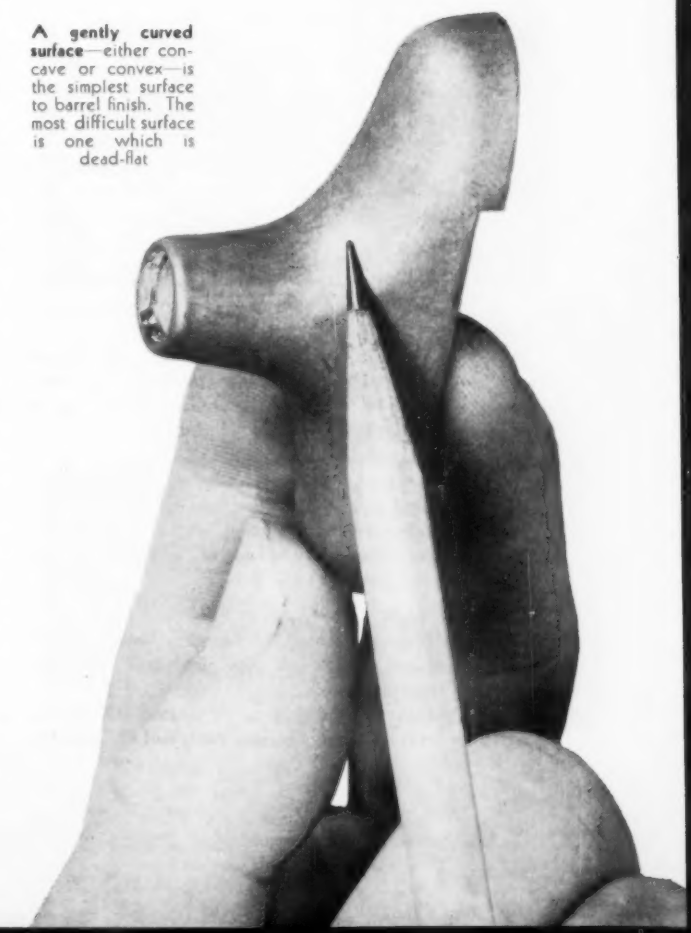
For the best results on nearly all other type metals the ceramic-bonded chip[1] is far superior to other types of stone. This type chip gives approximately 75 per cent to 80 per cent longer life than the natural bonded media, which reduces lodging problems, eliminates high screening costs, cuts down on the necessary storage space and reduces annual media costs.

The ceramic-bonded chip is manufactured with aluminum oxide grains of a uniform size, thus offering a uniform cutting surface which is continually being exposed as the ceramic wears away. The hard bond reduces to an absolute minimum the possibility of aluminum oxide impregnation of the surface being barrel finished.

Other types of media, such as steel chips, zinc shapes, steel balls, ceramic shapes and some improvised materials, find some application. There is one instance in which carpet tacks were used for surfacing small gears, and in another case glaziers' points have proven workable. Even shoe nails have been used successfully—but only under special conditions.

† *Regular "Honite" chips and "Honite" Micro Cut compound.*
[1] *Such as Super "Honite."*

The importance of using the right size chip is illustrated in this picture, which shows a small chip lodged in the recess of a part. Removal of lodged chips is costly and time consuming. A slightly larger chip would have avoided this trouble



A gently curved surface—either concave or convex—is the simplest surface to barrel finish. The most difficult surface is one which is dead-flat

COMPOUND SELECTION

Many companies are offering many types of compounds —and most of them are good. There are compounds available for deburring, cleaning, burnishing, coloring, degreasing; some for ferrous and some for nonferrous metals; some particularly suited to zinc, others specially formulated for use on aluminum. And there are all-purpose compounds.

If a manufacturer of a variety of parts was to stock a compound especially suited to each kind of metal used and every type of finish desired, the required storage space would be enormous. On the other hand, where production is centered around one type of metal part (say, a zinc die casting), it would be beneficial to stock a compound especially formulated for use on zinc.

It is at this point that a barrel finisher who has not made a study of compounds should seek the recommendations of a barrel finishing field engineer who represents a reliable firm.

For the manufacturer of a variety of parts, his recommendations would include the use of some all-purpose compounds which will perform more than one function satisfactorily. The simpler the barrel finishing procedure, the less time it takes to perform it, and the less skilled labor is required to handle the job.

Speaking of compounds generally, it is understood that at least one long-lived abrasive compound is necessary. This is usually a lubricated cutting compound with an aluminum oxide base, which has certain added properties which include inhibitors and chemicals to hold the color throughout the run. Foam generated by this type of compound carries the abrasive, suspends dirt and acts as a cushion. Long-life abrasive compounds should cut aggressively for eight to twelve hours, then break down and act as a honing agent to produce finer finishes.

Another abrasive material—which has a quicker breakdown for shorter runs—is desirable for the sake of economy. This compound is usually less costly than the first type.

The second phase of most barrel finishing cycles is the coloring run, and here an all-purpose compound should be selected—one that can be used on all types of metals, and which willproduce clean, lustrous finishes at reasonable cost.

USE OF WATER

In addition to the parts to be finished, media and compound, one other ingredient is necessary to the barrel finishing process—water.

Water levels are a matter of development, but in most cases low water levels are recommended for cutting runs because a high level will float the abrasive to the top of the load where it will be relatively ineffective.

When cleaning or burnishing, a good result is obtained by a water level about three inches above the mass (parts, chips, compound). This floats or suspends the dirt and cushions the cleaning run—reducing abrasive action to a minimum—but still permits refining of the surface as it is scrubbed and cleaned.

THE TRIAL RUN

There are three watchwords for barrel finishers—experiment, record and explore. A trial run comes under the heading of experimentation.

Carefully planned (and recorded) trial runs will set the pattern for mass finishing of a given part, and will indicate just how economical barrel finishing can be in any given instance.

Here are some recommendations for making a test run:

Load chips into the cylinder to a 40 per cent to 50 per cent level, and add enough work load (parts) to raise the total load level to between 50 per cent and 60 per cent of the barrel's capacity, depending upon the nature of the part. Then add a cutting or burnishing compound and enough water to bring the total load up to about 70 per cent of barrel capacity (using a lower water level for cutting than for burnishing).

A good starting speed for a trial run is 20 rpm for a barrel 30 in in diameter. As the diameter of the barrel decreases, speeds may be increased. Too much speed will "throw" the parts; too little speed will result in a longer-than-necessary running time. Check the work after 10 turns, after 20 turns, and then at five and 15 minute intervals. If, after the 15 minute interval check no undesirable results appear, continue the run with periodic inspection until the desired result has been achieved.

After attaining the desired finish, flush the barrel with clear water and empty the load onto a screen coarse enough to allow the chips to drop through, but fine enough to retain the parts.

WHAT PARTS CAN BE BARREL FINISHED?

Just about any parts that will fit into a barrel can be barrel finished; however, the shape of the part has a definite effect upon the finishing cycle.

The most ideal shape for barrel finishing is a gradual curve or gently rounded surface. The most difficult shapes to finish in this manner—that is, those which may require longer time cycles and draw more heavily upon the knowledge and experience of the finisher—are dead-flat surfaces, pieces requiring retention of sharp corners, or pieces with deep recesses.

An example of how ways can be found to barrel finish even the most difficult parts is that of a southern manufacturer of textile machinery, who is producing a steel roll which weighs seven pounds. Because of the way the roll is machined and ground, deburring by hand and subsequent polishing required 24 minutes per roll, after which the part was chrome plated.

The high direct labor cost for this operation prompted the firm's management to call in a barrel finishing field engineer.

By devising a simple fixture which held a sufficient number of rolls to make the operation economical, a finishing process was developed that receives an excellent plate. The fixture was dropped through the door opening and permitted to roll free in the media.

The first stage of the cycle was an abrasive run using a foaming abrasive compound[2] which left a clean and refined surface, and the final hour of the run was made in an all-purpose cleaning, coloring and burnishing compound.[3] The result was a completely deburred part with all grind pattern removed, and a lustre finish which plated to specifications.

[2] *"Honite" Speed Cut compound.*
[3] *"Honite" Multi-Burnish compound.*

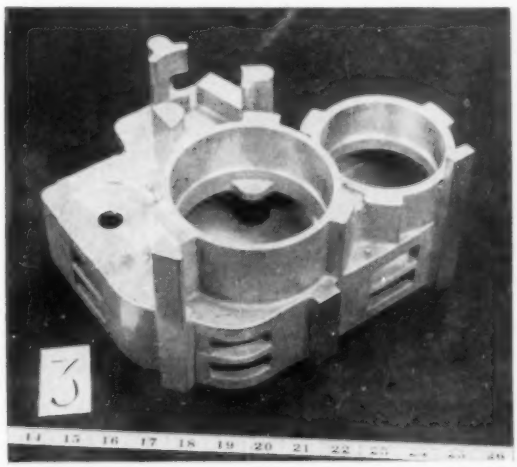
To complete the story, a fixture was designed for production purposes which could be used in any standard barrel. Use of the fixture reduced the finishing time per piece from 24 minutes of direct labor to less than three minutes—or a saving of more than 600 per cent on prefinishing.

With a modern barrel finishing machine . . . a basic knowledge of barrel finishing . . . and a few quality materials, mass finishing is being economically employed in many plants which once relied on other methods—such as the Philadelphia producer of low-cost zinc die cast drawer pulls, coat hooks and similar parts who barrel finishes them by the hundreds, then chrome or brass plates them without any intermediate operations.

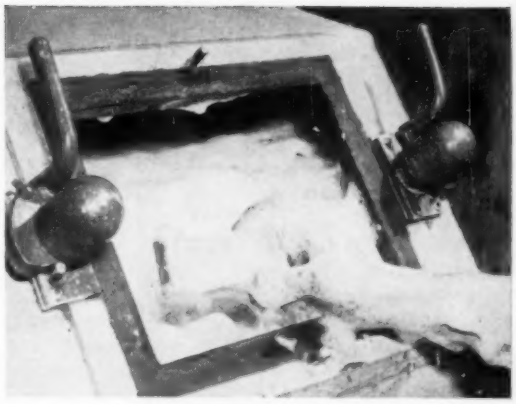
In addition to mass finishing, barrel finishing offers low micro-inch finishes on precision parts, production of controlled radii (within tolerances of 0.0002 in or less), and production of lustre finishes which can often be plated without buffing. A manufacturer of precision bearing parts uses a final barrel finishing operation to produce a surface with a reading of 2½-5½ micro inches—with an average stock removal of 3½ microns.

Whether parts are being finished by hand, or there is a barrel finishing system already established, a field engineer can be of value to the finisher. In the first instance, the field engineer will make a survey to determine how best to generate a refined surface through barrel finishing, and make recommendations for equipment and materials necessary for making trial runs.

Even where barrel finishing is established, a field engineer who is continually in touch with new techniques, new materials and equipment, and who has a good knowledge of what others are doing in the finishing field, may be able to solve technical problems that will further reduce finishing costs.



Here is a brief case history on a large part that is being barrel finished by an eastern instrument manufacturer; weight, 9 lbs; tolerance, .0005 in; operation, debur and polish; chip size, No. 4 Honite; water, 16 qts; compound, ½lb; barrel speed, 32 rpm; running time, 15 min; time per piece, 7½ min (two pcs per barrel); previous bench time per piece, 20 min



Here is an illustration of the amount of foam generated by a cutting compound. The foam serves a useful function during the run in suspending dirt, carrying the compound and cushioning the mass

Hundreds of these steel slide projector parts are being barrel finished in a single run by one of the nation's leading camera manufacturers. By carefully studying the finishing method, the manufacturer was able to make slight changes in types of compound and media, thus reducing the time cycle by 50 per cent, and generating a better finish

Nunn

William P. Nunn was formerly associated with SKF Industries in Philadelphia, at first as an industrial engineer and later as supervisor of barrel finishing, with a special assignment to expand the barrel finishing program. Nunn went from there into the sales engineering field, then became a "Honite" field engineer for Minnesota Mining and Manufacturing Co., St. Paul, Minn. He now lives in Riverside, N. J., and covers a 14-state area with headquarters in the 3M Company's branch in Philadelphia.

Polishing Grinding Wheels

Through new methods in grinding and finishing, metal surfaces are being prepared for plating, painting or architectural finishing in fewer operations than was ever before possible—and finishes are in many instances better than those produced by previous methods.

With the replacement of setup wheels by coated abrasive polishing and grinding wheels, and the reduction in the number of buffs, production is increased, unit costs lowered, and machinery is utilized more fully.

Using coated abrasives in the form of polishing and grinding wheels, draw and die marks and other imperfections are being removed from metal in the same operation that produces a surface with a micro inch finish of 4½ to 5.

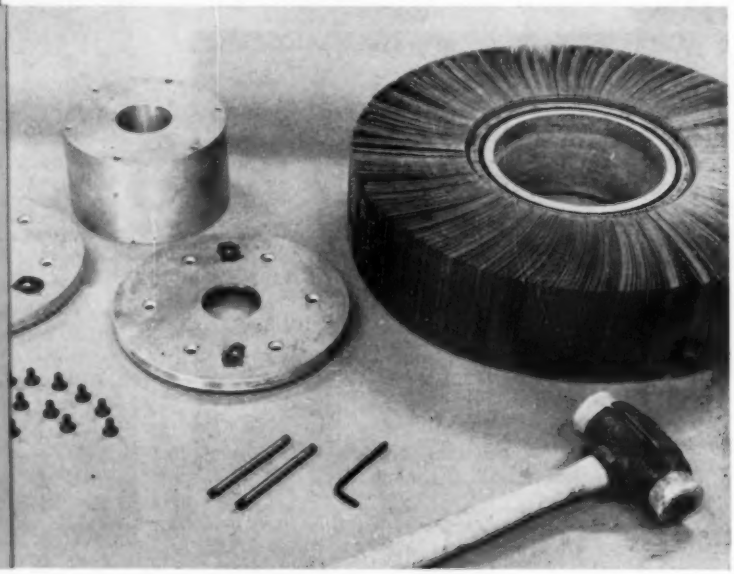
As a result, parts are coming off many production lines and going right to the plating department without being compounded and buffed, which in most cases is not possible using other finishing methods.

The wheel is being employed by manufacturers of a variety of products, whose plating procedures vary considerably. Industries in which the wheels are being used to generate preplate finishes include: appliance (toasters, frying pans, irons, cooking utensils); automotive (bumpers and guards, spotlight reflectors);

* R. W. Reed, New Methods Development Section, Coated Abrasives Division, Minnesota Mining and Manufacturing Co.

Except for the addition of the hub assembly, coated abrasive polishing and grinding wheels are ready for use when received. Less than three minutes is required to ready the wheel for machine use

The new polishing and grinding wheels are also being used for hand polishing. The wheel is formed to the work piece with only slight pressure on the part of the operator. Once the wheel is formed, the operator exerts less pressure for polishing than is necessary using other types of wheels



R. W. REED*

furniture (metal stools, chairs, tables); hardware (plated ornamental fixtures); and steel (tubing).

The polishing and grinding wheel,† differs from any polishing device ever used on production lines. The wheel actually removes stock as part of its polishing action, a factor that allows it to generate a smooth finish faster than any other present method.

The device consists of hundreds of pieces of cloth-backed coated abrasive, factory-formed into a wheel that can be used on rotary or straight line automatics, or on standard lathes for hand operations.

Because of its construction, and the fact that both the abrasive mineral and cloth backing wear away while the wheel is in use, the wheel quickly takes the shape of the piece being polished—and it retains that shape throughout the life of the wheel.

As the wheel wears away, its rate of cut and the micro inch finish it produces remain constant. It is not necessary to increase arbor speed to maintain cut during the life of the wheel. Its sharpness is assured by the new mineral that is continuously being presented to the work.

In a 16-inch diameter polishing and grinding wheel there are more than 1,000 pieces of coated abrasive cloth. This means that when the wheel is running at a speed of 10,000 surface ft/min (or approximately 2,400 rpm) about 2,400,000 pieces of coated abrasive contact the work piece every minute.

Three factors that influence polishing and grinding wheel operation—and especially effect the quality of finish obtained—are pressure, speed and lubrication.

The polishing and grinding wheel works most economically under 12 to 15 pounds pressure against the work piece. On automatic machines, wheel heads either should float or be cammed to follow the contour of the piece being polished. With proper pressure, polishing and grinding wheels have been in continuous operation up to 35 hours before replacement.

For a wheel 16 inches in diameter—the most popular size—the recommended running speed is at least 9,000 surface ft/min, or 2,000 rpm. Wheel speed need not be increased as the wheel wears and becomes smaller in diameter, because the shorter abrasive sections become more firm as they get shorter, thus compensating for the reduced surface speed.

† Designed by Minnesota Mining and Manufacturing Co., St. Paul, Minn. and designated "PG" wheels

The new wheels quickly take the shape of the part being polished. On the parts shown here, wheels are averaging more than 14,000 pieces before replacement is necessary

All photos courtesy of Minnesota Mining and Manufacturing Co.

This picture of a stopped wheel indicates the action of the coated abrasive pieces on the work piece, and shows how closely they conform to the work

The wheels require no special lubrication equipment. Lubricant is applied through a controlled system such as is used with many present grinding and finishing systems. The lubricant (usually oil) will increase wheel life, improve the cut of the abrasive (the abrasive actually cuts or shaves the metal, rather than burnishes it) and subsequently contribute toward a finer finish. The lubricant should be applied to the work piece just prior to contact with the polishing and grinding wheel.

In some instances, it has been found desirable to soak the wheels in light machine oil and allow them to drain briefly just prior to putting them on the machine. This actually gives the wheel a lubricating quality of its own.

Use of the new wheels on finishing lines has substantially reduced the number of sisal buffs formerly required, and eliminated some of the buffing previously done as part of the plating operation.

For example: a grit sequence of 220–240–320 wheels conditioned steel for plating with bright nickel and chrome, eliminating the need for a nickel buff . . .

Where the plating sequence calls for buffing copper, a grit 150 wheel has successfully generated a preplate finish on steel without the need for sisaling.

A western manufacturer of brass plated products increased production 533 per cent—from 300 units to 1,900 units per 8-hour shift—by putting a polishing and grinding wheel on a semiautomatic floor lathe. His previous method consisted of sewed buffs with grease to remove scratches and orange peel from cold roll steel, followed by sisal buffs with compound to produce a finish suitable for plating. With the polishing and grinding wheel (self-shaped to the work) replacing the sewed buffs, a better finish is being produced with only light sisaling required before plating.

Another instance in which the wheels have reduced the amount of sisal buffing required for a given finish is that of a bumper guard manufacturer. On his straight line automatic there were 14 setup wheels and eight sisal buffs, which produced a 5½–6 micro inch finish prior to plating.

Fourteen polishing and grinding wheels were placed on the line in place of the setup wheels, and four sisals were retained, with the result that the guards are coming off the line with a 4½ micro inch finish—and guard production has been increased more than 20 per cent.

For an eastern manufacturer who uses welded carbon steel tubing in the manufacture of his product, three polishing and grinding wheels grit 320 (followed by two sisals and a color buff) are producing a better finish than were four abrasive belts ranging in grits from 180 through 320, plus the sisal and color buffs.

Experimental work is now being done to evaluate the use of the wheels for o.d. polishing of both carbon and stainless steel tubing. With polishing and grinding wheels, indications are that a lower rms reading can be produced in fewer passes, which would save both finishing and plating time.

The same story of production increases, better finishes and subsequently lower unit costs is holding true wherever the new coated abrasive wheels are being installed on production lines.

In calling the polishing and grinding wheel the "most significant development in polishing methods" in the last decade, however, the manufacturer believes that the real significance of the wheels extends considerably beyond present applications.

This development has introduced a new concept in metal finishing, and will make it possible to incorporate into continuous finishing lines abrading jobs which are currently being handled as separate operations.

There are finer and coarser grit polishing and grinding wheels in the offing—wheels that it is hoped will eventually entirely eliminate the need for buffing, and which will produce polished surfaces that will accept perfect plates with even the simplest of plating procedures.

R. W. (Bill) REED joined the 3M Company in 1946 as a production engineer, and two years later moved into the firm's new methods development section, coated abrasives division. He is a mechanical engineering graduate of Colorado University. In his present capacity, as assistant manager of the new methods development section, Reed, 32, is closely associated with the 3M Company's "PG" wheel development.

"SCRATCHING the SURFACE"

ARTHUR VON DER LINDEN† and STEVE YACUS*

The following article on barrel finishing was written primarily to illustrate that in spite of the many improvements made on equipment, materials and operating techniques for finishing of metal and plastic parts, the industry has not begun to "scratch the surface" of the possibilities of this usually economical operation. Many well written articles have been published covering the techniques used by cost-conscious management to reduce labor costs for deburring, polishing, burnishing, descaling, and surface-finishing a wide variety of parts ranging from large jet engine housings down to minute instrument pinions less than 1/16 inch long. There is no need to "re-hash" the merits of various equipment, materials, medias, motions, diagrams or opinions expressed in these excellent articles. Rather, this presentation deals with the problems faced during the past year as barrel finishing distributors, equipment builders and jobshop operators.

Racking—Engineers and supervisors in many plants by now have recognized the fact that many large and/or delicate parts can be barrel finished successfully if the proper loading and unloading technique is used and the drum is properly loaded with the right materials and revolved at the correct speed. Many plants have gone a step further and fixturized the parts in the barrel to eliminate any possibility of nicking and have obtained some unusual cost reductions over previous methods. Equipment is commercially available for these racking operations and generally falls into four categories: (1) Rack stationary in barrel, fastened to either the center line of the drum, to the sides of the barrel, or to the large door (across two flats of the octagonal drum); (2) Rack suspended at center line of drum so as to rotate freely as the drum and media revolve about it; (3) Dual-action racking system where the drum and media revolve in one direction and the rack is driven in the opposite direction or the same direction at different velocities; (4) Racking of parts or separate racks to a polysided drum which may have 8 to 12 doors, one on each flat. Racks are made to fit the door openings and can be removed easily without unloading the media or compound.

In several instances manufacturers did not have sufficient production of a large or delicate part to justify a racking installation. These parts had to be run in a job shop. Because of the limited quantities, economical racks had to be devised and equipment costs kept at a minimum to show a good saving over previous methods. This can be accomplished by building a special one-compartment drum 48 inches long by 30 inches diameter across octagonal flats, with a large door opening across two flats and a smaller standard size door on the opposite flat for easier loading of media and flushing operations. This special drum can be easily exchanged for the standard 48 in x 30 in two-compartment drum normally mounted in a machine which has variable speeds. Thus, a machine is devised which can economically handle all racking jobs (except for dual action) and still be used for large runs of standard tumbling. The racks were very simple in construction, usually utilizing a basic welded steel rectangular frame 31½ in wide by 47 in long which locks itself across the corners of the drum when the large door is in place. Large parts are fastened to cross bars attached to the basic rectangular frame and rack costs are held to a minimum.

Another noteworthy racking device has been used in a standard two-compartment 48 in x 30 in octagonal drum with the usual one flat door opening (23 in x 10½ in). The parts racked were approximately 6 in diameter by 2 in wide,

* Metal Parts Sales Co., Newark, N. J.
† President, Metal Parts Processing Co., Newark, N. J.

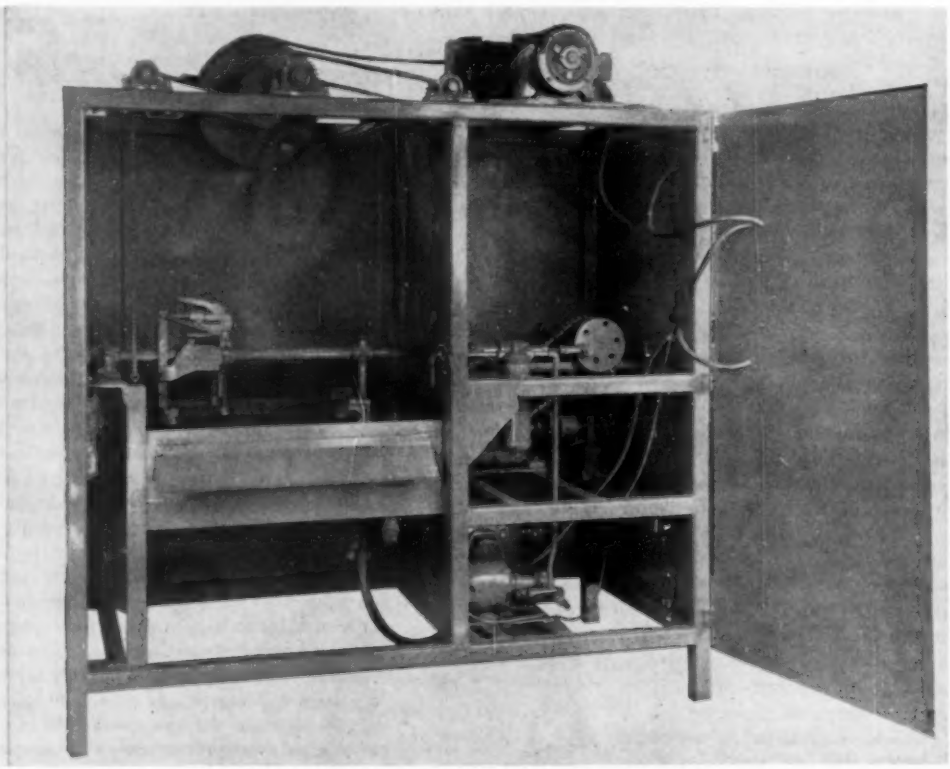
and the standard drum had to be used to get production. Thirty four pieces could be mounted on a square frame 22 in x 31½ in (locking across corners) which brought the job processing cost to about 50 cents each, or slightly higher than the customer wanted to pay. Inserting the first rack into the compartment inverted, and then placing the second rack (22 in x 31½ in) on top of it met the problem, and 64 pieces per compartment could be run (racked) in a standard machine by using a "split-rack."

Barrel finishing enthusiasts are undoubtedly familiar with special purpose machines which are not truly "tumbling" machines but still do the same type of deburring and finishing. These are the machines where the principle of a large rotating cylinder (loaded with fine media) rotates on a verticle axis while the fixtured pieces are held or rotated through the media. This system works out very well on many parts, but it was found impractical when faced with the problem of ball burnishing to a high lustre a large flat aluminum casting measuring 12 in wide by 20 in long with a recessed well 4 in deep.

Tests proved that a satisfactorily burnished plate was obtained when 3/16 in hardened steel balls and proper burnishing compounds were used in a standard burnishing barrel, in 1½ to 2 hour cycle. Disadvantages were excessive nicking of edges, (even with one piece per compartment) and prohibitive costs for equipment, as several hundred of these large aluminum castings were required each day at a minimum finishing cost.

Pictured below is the machine which was built to ball burnish these large aluminum castings to a high lustre in less than a *two minute cycle* for each plate, with load and unload times of less than ten seconds included. The principle of operation consists of pushing and pulling the racked aluminum plate through a mass of steel shot, which are contained in a specially shaped pan which automatically raises and lowers for easy load and unload operations. The reciprocating shaft onto which the part is racked has an adjustable stroke, and is driven by a variable speed unit to give a wide range of applications. Special features are two timers for length of running time and pan raise and lower cycle, a magnetic slip-clutch to avoid damage to parts when pan is raising, and a filtering unit to keep the burnishing solution clean for several days at a time before solution is changed. The operator merely loads the plate into the rack, pushes the start button and proceeds to unload and load the second and third machines while the pan raises to proper burnishing height (as the rack is reciprocating through the steel balls). At the end of the preset burnishing cycle, the pan automatically lowers and the machine shuts off (two minute cycle in this case).

This same reciprocating action has been successfully applied to deburring and surface finishing other parts with abrasive chips used as media instead of steel shot. As many as 30 pieces had been put on a rack at one time, the rack clamped on the reciprocating shaft, and the parts deburred completely in cycles of minutes as compared to



Ball burnishing machine for large aluminum castings

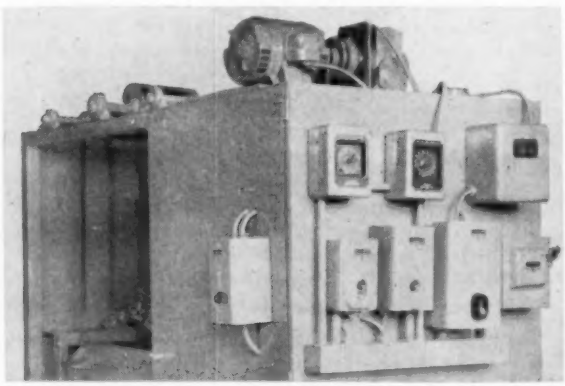
hours of tumbling by the usual methods. Another distinct advantage noted was the burnishing and deburring actions possible in recessed areas which could not be accomplished satisfactorily by any other method.

HIGH VELOCITY FINISHING

Very little has been written about recent developments in the field of rapidly agitating mixtures of media and tiny parts to deburr and finish these pieces, especially on parts which cannot be deburred by the usual tumbling methods. Experiments in the field of vibrating and shaking machines (either magnetic or mechanical types) have proved very successful in some cases, and the field of 'high velocity" finishing may prove a fertile field for exploration. Experience has been limited (in our case) to a special machine devised for deburring small pinions and gears, as well as successfully doing some "internal" deburring. Results obtained on the "shaking" machine show that (1) deburring cycles of 2 to 3 minutes are possible on small parts which previously required 40 to 60 hours of tumbling time or which had to be hand deburred; (2) deburring of internal burrs (such as found on the inside of holes and slots) is possible by "high velocity finishing" where ordinary tumbling does not even touch these burrs; (3) closer tolerances can be held when removing burrs on hidden edges where other surfaces must be held to the proper dimensions and excessive radii on exposed edges are undesirable.

The first "shaking" machine proved unsatisfactory because of limitations on speed, length of stroke, period of oscillation, and many breakdowns due to excessive vibrating. At this writing, a unit which will have double the capacity of our original "shaker," be free of vibration, have variable speeds, variable stroke, variable oscillations, and be able to produce a gentle reciprocating action or a violent elliptical throwing action is in the process of completion. When this machine is completed, further tests will be conducted on various types of media (wet and dry), on liquids to be used (oils, alcohols, acids, chelating compounds, glycols, etc.) and on various combinations of "high velocity finishing" with submerged finishing and racking of parts. The results obtained by this series of tests on materials used, as well as the controlled motions and velocities, will prove extremely useful in cutting deburring costs for manufacturers of precision machine, instrument, and electronic parts.

New parts received for sample processing present individual problems which often cannot be solved by any cut-and-dried formula or method. The more it is learned about barrel finishing, the more apparent it becomes that the field is still in its infancy and the industry hasn't begun to "scratch the surface" in developing the right methods, equipment and materials to do every job in a set time cycle according to a rigid formula.



ARTHUR VON DER LINDEN organized Metal Parts Processing Company in 1948. His background includes fourteen years teaching experience in industrial arts and machine shop, after which time he was associated with Elastic Stop Nut Corporation in the capacities of training director, personnel manager and service engineer. In 1946 he became interested in barrel finishing and organized Metal Parts Processing Company in 1948. At the present time Metal Parts Processing Company is a distributor of Minnesota Mining and Mfg. Company's Honite abrasive chips and compounds, and manufacturers all types of standard and special tumbling equipment as well as operating a job shop.

Arthur received his education at Newark Normal School; Newark Technical School (Mechanical Engineering); State Teachers College obtaining a BS degree in 1939; New York University (Graduate Work in Administration).

STEVE YACUS, a native of Newark, N. J., attended Newark Central High School and is a graduate of General Motors Institute, Flint, Michigan, receiving his BS and ME degree in 1944, and in 1948 completed post graduate work receiving the degree of Bachelor of Industrial Engineering from the same Institution.

His thesis "Metal Finishing of Automobile Bodies" attained publication, and Yacus was associated with Buick-Oldsmobile-Pontiac Division, General Motors Corp., at Linden, N. J., Wilmington, Del., and Atlanta, Ga., as superintendent of metal finishing until 1949.

Yacus was most recently employed as Sales Engineer by Almco Division, Queen Stove Works in their eastern branch. Was Secretary-Treasurer for Metal Finish, Inc. for 1½ years on barrel finishing.

Yacus has been in the barrel deburring and finishing field for the last ten years. As of the first of this year, he organized Metal Parts Sales Company as a separate sales agency for Metal Parts Processing Company in cooperation with Arthur F. von der Linden.

von der Linden

Yacus

Pointers on Polishing

by L. H. VORCE*

Electroplaters spend their lives immersed in metallurgy and electrochemistry, yet no matter how thorough their command of these sciences, they still depend heavily for the perfect plating job on the physical finish produced by buffing and polishing.

Happily, better finishing materials and techniques are being introduced constantly. In this progress, the abrasives industry is keeping pace and sometimes even leading the way. And the machine tool manufacturer is matching these advances with improved equipment that spells better finishes, produced more consistently and at lower cost than that available only a few short years ago.

*Behr-Manning Division, Norton Co., Troy, N. Y.

To cover the whole range of this subject is impossible here. But the experience gained over the years in small and very large plating operations suggests the worthwhile review of a few major points, doubtless well known, but certain trouble-makers if ignored.

The first and foremost wrecker of good finishes (and shatterer of cost estimates) has nothing to do with actual plating technology. It is the downright abuse to which parts are so often subjected after final polishing and before plating, or even after plating. The writer has seen products bumped, banged, dented, scarred and scratched while being stored or transported between departments. In some plants, finished parts bearing all the labor cost,

equipment cost and polishing and plating room overheads, are dumped carelessly in bins while awaiting transfer between process stops. Most of the parts so treated—"handled with pitchforks," as the trade terms it—are unfit for plating when they reach the tank. That means production delay, extra material handling, time-wasting rework on the polishing line, and, worst of all, a murderous spoilage rate.

Abuses such as these are by no means confined to any one type or size of shop. You find them in the smaller contract or captive department and in the high-production plant. Perhaps the writer can drive home the seriousness of this waste by reporting cases where a sizable quantity of parts had to be sent three times through the polishing line.

Often, the roughing operation could be eliminated entirely if metal were handled properly before and after polishing. This is particularly true of steel stampings. With proper handling of these stampings, it would be necessary only to polish off the draw marks and oil out the finish for plating—assuming, of course, that the work was free from surface defects such as orange peel, stress marks and the like.

Users of set-up wheels face a deceptive and costly situation, if they're not watchful, in the apparent buffing out of nicks or scratches. The abrasive grain on a buffing wheel, usually rolled on in a trough, tends to lie down under pressure, failing to present its sharp edges to the work. This characteristic will fold over many surface defects, permitting them to pass buffing inspection, but the defect will then pop up again in plating, at the point where a reject is most costly. The modern abrasive belt with its electrostatically deposited abrasive, presenting the sharp edges to the work, will not perpetrate this kind of deception.

The past year has proved out an interesting development: the superior performance of silicon carbide over the aluminum oxide belt in cleaning up brass, bronze, aluminum and zinc die castings.

Basically and throughout metal finishing, the way to eliminate operations is to select the correct combination of contact wheel type, the proper speed and the right abrasive belt. Preparing nonferrous metal parts for plating calls for soft-density contact wheels, the use of belts with ample flexibility for these softer wheels, and the selection of the proper lubricant to keep the belt wet, hence free-cutting and non-loading. Being air-cooled, a belt will congeal many greases very rapidly. The recommended "hard-oil" lubricant becomes and remains liquid under pressure of the work.

Most platers or polishers, trying to solve the multiple problem of selecting the right wheel, grit sequence, speed and belt, can save a great deal of time and money by consulting the abrasives manufacturer, who has lived with the problem and has amassed the experience required to provide the right answer promptly. The manufacturer offers this counsel free in the Methods and Equipment Demonstration Rooms he operates in major cities throughout the country. In these clinics, the polisher or plater can see tests run on his own work pieces, and can bypass a great deal of expensive trial-and-error work.

At this point, it may be well to emphasize one common trouble spot, and suggest a simple cure. Many polishers find themselves unable to use narrow and soft contact wheels in their shops because they lack the proper backstand equipment. The difference between proper and improper tracking of belts on such wheels is determined by the positioning of the idler or idler pulley in relation to the contact point on the contact wheel. It's vital to have ample wrap-around of the belt on the contact wheel, ahead of the contact point, and to get it, the idler pulley should be mounted on the floor. A small degree of wrap-around doesn't allow the contact wheel to guide the belt properly when the soft edge of the wheel is collapsed by pressure of the work at the contact point. Longer wrap-around does a better job of steering, so that the belt does not slide across the wheel or come off it entirely.

Another advantage of a generous wrap-around is that it allows a greater variety of contoured parts to be polished on a single-density wheel. This is especially true for flash removal from zinc and aluminum die castings and from many brass items. Product engineers† can provide—and demonstrate—valuable information on this point.

Many plants use offhand polishing, but wherever the quantity justifies it, production rates can be stepped up and more uniform finishes produced with semiautomatic work holder, or with rotary or straight-line automatic equipment.

It should be borne in mind that polishing costs don't necessarily end in the polishing room. High numerical production doesn't mean much if wild grain marks or other finishing defects are showing up after plating. There's little profit in stripping off finished parts!

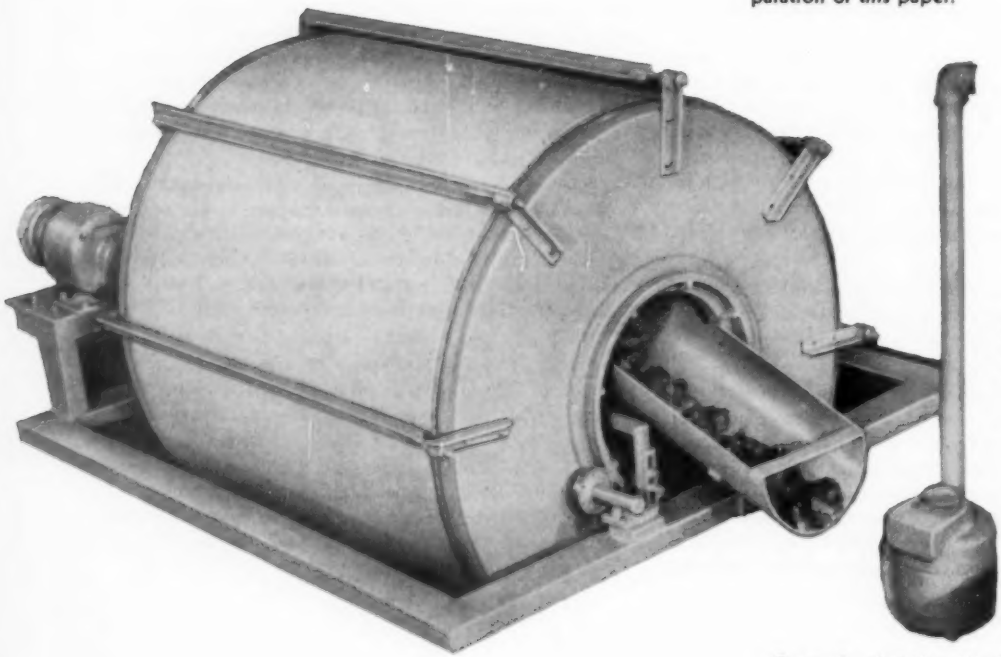
PRE FINISH OR FLAT POLISHING*

METHODS AND PROCEDURES OF METAL FINISHING AS APPLIED TO FLAT POLISHING

by R. W. REDMOND†

*This presentation is an expansion of a paper, given before many branches of The American Electroplaters Society by the writer.

Credit and appreciation is extended for the suggestions and assistance given in the preparation of this paper.



Illustrations used are by the courtesy of the Murray-Way Corporation.

†Engineer Consultant, Murray-Way Corporation

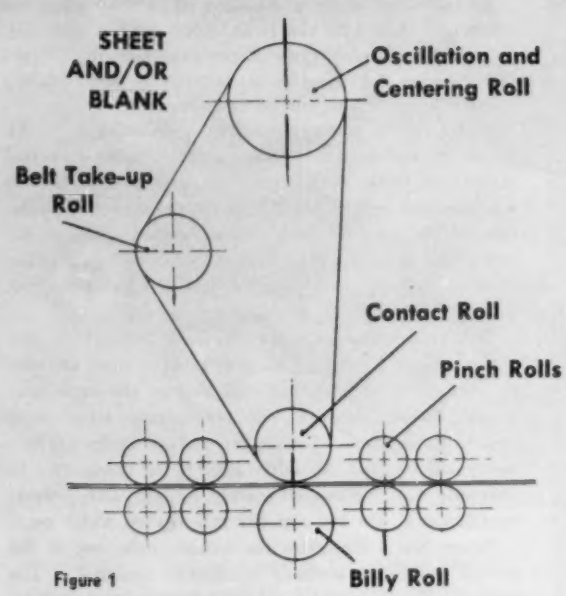


Figure 1

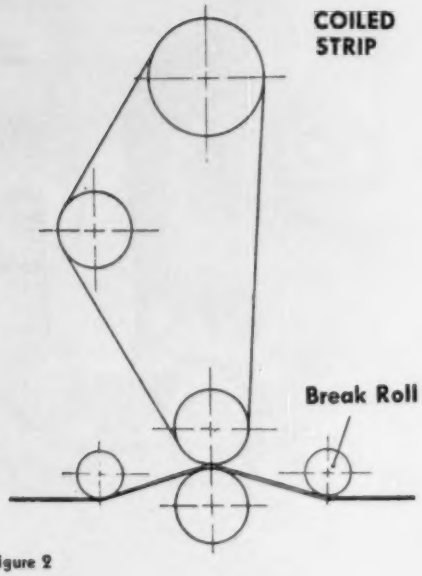


Figure 2

The polishing or finishing of steel has emerged from being an art. It was hidden so many years but now it has become a precise, mechanical process. From a dark corner in the rear of the plant, automation of polishing is where all can observe and wonder at its accomplishments. Skilled men now handle the operations, with vastly increased production, with uniformity and better results than ever before obtained, and at lower costs.

Flat finishing is a means of grinding steel in the form of flat sheets, strip or coil by a selected series of abrasive belts to the degree of finished surface as required by subsequent operations or end products. Expressed simply, the steel to be finished is passed traversely through the polishing unit, held in position by pinch rolls, as the abrasive belt suitably contacts the surface being finished. Reference is made to Figures No. 1 and No. 2 in which is shown diagrammatically, the scheme of operation.

The stock passes between the pinch rolls, positioned by the billy roll agreeable to stock thickness and against the fixed position of the contact roll, around which the abrasive belt travels. Figure No. 2 is the same as No. 1, with the exception that the billy roll is placed slightly higher to compensate for the slight slackness of coiled steel, and to maintain uniform surface with the contact roll. This is an adjustable feature. These polishing units, or heads, may be used singly or in multiple tandem assemblies. The number of heads being used as a unit depend upon the relationship of required speed of operations to a given volume of work to the required finished surface. All pinch rolls, whether the heads are as single or multiple units are externally driven at uniform rate of speed by a single drive, providing the forward stock flow at predetermined speed. This speed, normally is 30 feet to 60 feet per minute. Conditions of operations may alter this speed much lower, or increase it somewhat. In this regard, it is well to keep in mind that the faster the rate of speed of stock transfer, the greater the number of heads or passes that will be required to produce a desired surface. Conversely, the lower speeds will require fewer heads. The pinch rolls are covered with a heavy serrated rubber cover providing a gripping action for stock transfer.

The top or oscillation and centering roll has an important part in the machine operation. The width of belt travel, from side to side, is controlled by a simple air pressure device and is adjustable to belt widths used. The importance of the oscillation is based on the fact that the continuity of the scratch pattern from the abrasive belt is broken to minute lengths.

The belt take-up roll, actuated by air pressure, as the name implies, places the correct tension on the abrasive belt. In installations where the two roll machine is used, instead of the three roll, the belt tension feature is transferred to the top or oscillation roll.

The contact or drive roll is in a fixed position being covered with a heavy serrated cover of rubber, which cushions the abrasive belt against the metal surface being abraded directly beneath.

The speed of belt travel will vary between 4000 to 6000 linear feet per minute, with 5000 linear feet per minute being an average. This is an engineering factor when an individual project is under consideration.

It is noted from the foregoing that with belt speed at 5000 linear feet per minute, and stock traverse speed at 50 to 60 feet per minute, the dwell time of the abrasive belt on the surface being ground is small and places definite limitations on the metal that can be removed in the time available.

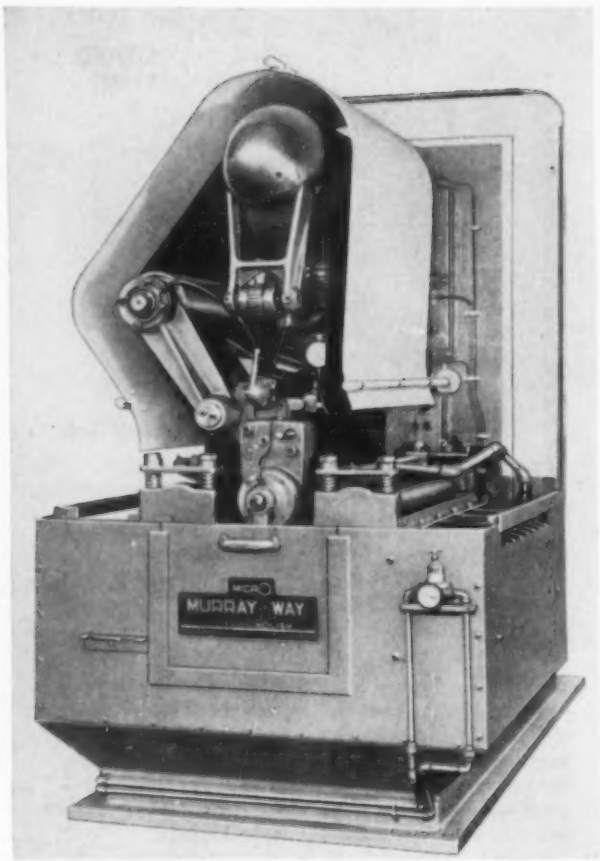


Figure 3

Figure No. 3 shows a standard 30 in head ready for operations, but with the front upper cabinet removed, providing an excellent view of the unit assembly. Figure No. 4 shows a 12-head in-line setup with hand loading entrace conveyor, and similar unloading.

Flat polishing machines are built usually for 6, 12, 20, 30, 40, 50, and 60 inch widths of abrasive belts. In actual operations, metal stock widths are held to 1 in to 2 in less than belt widths used. This allows for proper oscillation of the abrasive belt. It is emphasized that flat polishing machines will operate at full efficiency, if either abrasive belts or stock passed is less in width than that for which the machine was designed.

Flat polish machines are designed for wet or dry operations. With wet polishing suitable coolants are used to wash away abraded material, and at the same time provide better abrasive belt life cutting action with smoother operations. Certain types of operations are best performed dry, and the only change in the machines is to eliminate the coolant circulating system and provide ventilation of 250–300 cfm per inch of belt width used.

Figure No. 5 illustrates the wringer rolls, one of the several groups of auxiliary equipment available. The wringer rolls are smooth faced, rubber covered, of medium density. Their purpose is to remove all surplus coolant from the metal surface. They are always placed at the exit position of the last head in the line, and are driven by the pinch roll shafting. They also serve as sheet ejectors.

Figure No. 6 illustrates the entrance deburr rolls. These are heavy, hardened steel rolls, driven from the pinch roll drive shafting and their purpose is to eliminate burred edges on sheared or slit stock. This in turn stops abrasive belt cutting as well as minimizing roll wear.

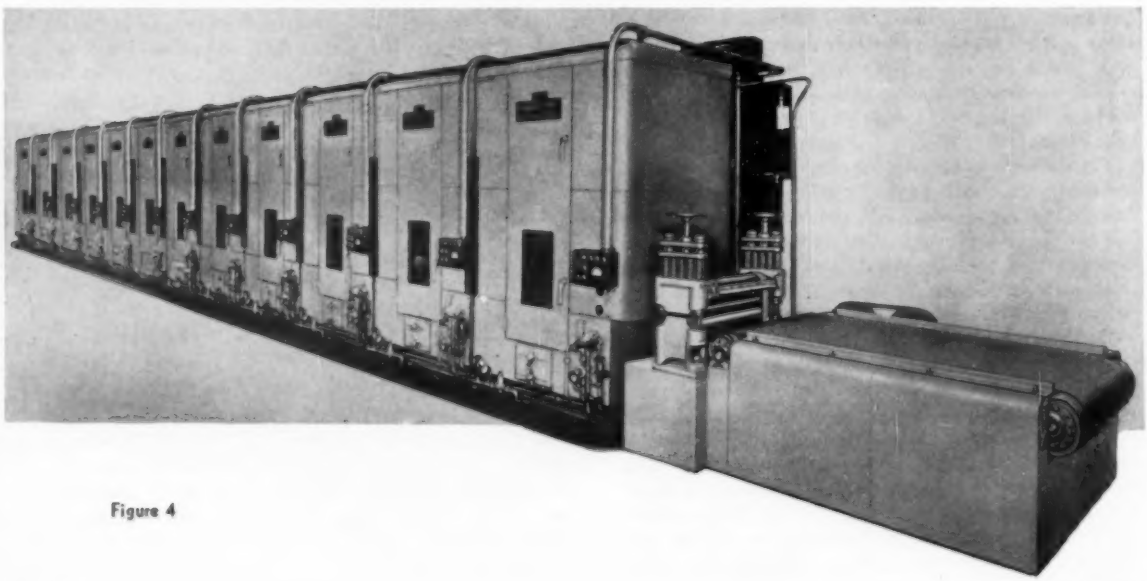


Figure 4

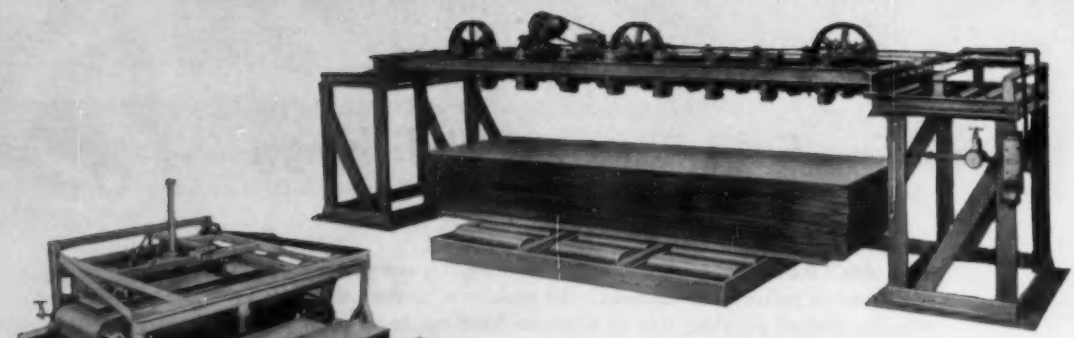


Figure 8

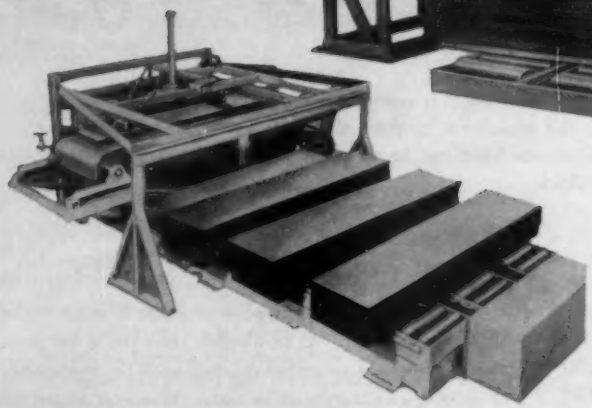


Figure 7

Figure No. 7 illustrates one of the several available types of sheet loaders, used in conjunction with the floor transverse conveyor or crane-saver. The crane-saver is made to any length, holding stock to a day of operation. The steel lifts are progressed forward automatically as the stock is exhausted beneath the loader. Individual sheets are lifted and released on entrance conveyor to heads in a predetermined pattern at adjustable speeds for constant stock flow. Other types of loaders are capable of transferring sheet steel to 200 lineal feet per minute. Automation, such as this, minimizes manual labor and provides other economies.

Line unloading at the same rates of speed is accomplished by the same machines with a reversed mechanism.

Figure No. 8, illustrates the drop-through inspection unit. In high productive capacity polishing lines, there are usually two sections; the roughing and the finishing. Steel, being what it is, always carries a varying percentage of pits and laminations which must be eliminated in the finished surface. An inspector operator observes the steel as it emerges from the roughing line, and as defects present themselves, controls are handled causing the defective sheet to be dropped and stacked. The unit automatically returns to the through position for the next sheet which is accomplished at line speeds. This operation eliminates processing of rejected steel through all steps.

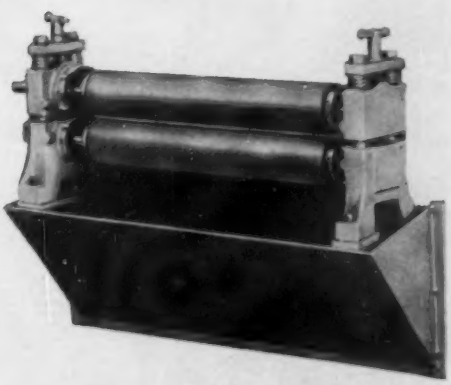


Figure 5

Figure 6

Processing Subsequent to Polishing . . .

To obtain the maximum benefits of flat polishing, it is essential that certain processing subsequent to polishing be followed. The equipment for these steps are usually placed with the finished polishing line to eliminate handling, to maintain the processing as a unit, with uniform transverse flow of stock.

STEP NO. 1, WASH

The equipment for wash and rinsing is constructed in agreement with the best practices, modified to meet the conditions of stock handling of sheet or strip steel. Rugged construction, ample capacity, simplicity of maintenance and operation for soil removal are the keynotes of such units.

STEP NO. 2, PHOSPHATING

The remarks covering washing are applicable to the phosphating section. Phosphate coating to the extent of 150–200 milligrams per square foot is found to be adequate for many accepted procedures. Such coatings should be fine grained, dense, and at the same time have ample porosity to provide excellent adhesion for the subsequent applied draw coat. Reference is made to PLATING, June 1955, for an excellent treatise on the subject.

STEP NO. 3, APPLICATION OF DRAW LUBRICANTS

The application of successful draw lubricants to the highly polished and phosphated steel surfaces is one that cannot be overlooked in any detail. Three methods are usually considered:

1. Spray Application.
2. Slushing with air knife usage, or pinch roll wiping
3. Roller Coating.

The first two methods while having some advantages, do have inherent faults that make their usage somewhat undesirable. The spraying booths and air exhaust systems do need much space. Slushing and dipping with necessary tanks also require a great deal of space. Both methods lack uniformity. Application by means of roller coating is now considered the most advanced method for the reasons, minimum floor space is used, one or both sides of material is coated, accurate film thickness of coating is applied and maintained and area housekeeping is very low.

STEP NO. 4, DRYING OF COATING

The means of drying applied coatings is a matter of local consideration. As to whether the oven is gas fired, electrically or steam heated depends upon the availability of utilities and their relative costs. Whatever means are selected, the oven must have the capacity to do the required work in time permissible. The author's own preference is in favor of the circulated gas fired oven.

STEP NO. 5, UNLOAD

The unloading and stacking of sheets was briefly mentioned previously.

The only exception to material handling throughout the foregoing is in the instance where steel is in coils. In this instance, coil handling units must be adequate in capacity to function under the conditions of operations.

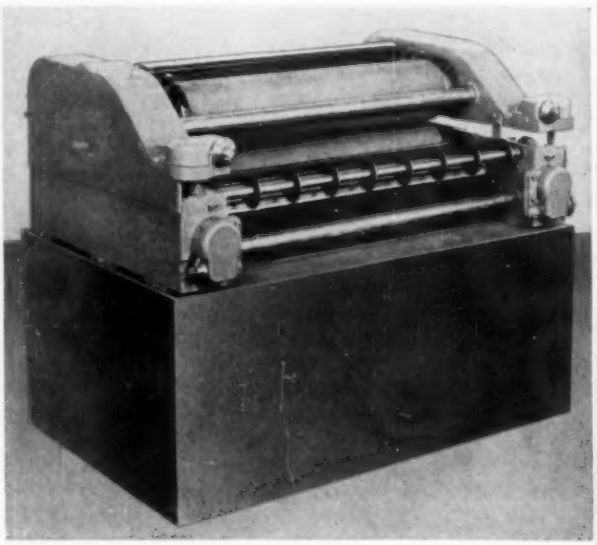


Figure 9. Roller Coater

Project Development . . .

The development of a project for the prefinishing of steel necessitates the serious consideration of many factors, i.e.

1. Study of present requirements.
2. Study of anticipated future requirements.
3. What steel types in current usage.
4. What are future anticipations.
5. Will lower steel grades, prefinished, satisfy requirements of production.
6. The number of heads required to prefinish steel as required in keeping with productive needs.
7. Determine equipment and type for subsequent treatments.
8. Estimate of capital costs, and of operations.

Flat polishing accomplishes many things, i.e.—

1. A greater percentage of square foot area can be prepolished in a fraction of the time required for any type of contour polishing.
2. Cost per square foot is by far the lowest of all methods.
3. Large savings are made with use of lower steel grades, rather than use of higher finishes.
4. Greatly improved press and die action will be obtained.
5. Orange peel and stretcher strains will be minimized or eliminated with better selection of steel grades.
6. Steel breakage is minimized.
7. Prepolished steel (to 5–8 micro-inches) produces outstanding results with the most exacting modern plating practices.
8. Prepolished steel provides a uniform surface, permitting a plating deposition of maximum protection with minimum plating.
9. Metal surface fragmentation or fuzziness is eliminated.
10. Prefinishing, with subsequent forming produces lower unit costs.
11. Rejects due to base metal finishing are essentially eliminated.

The prefinishing of sheet steel is a variable process, and, as stated previously, is dependent upon the requirements of local conditions. The finish may be rough and coarse or as low as 5 micro-inches, and both surfaces are equally satisfactory. Production daily needs may call for a minimum number of heads with repassing on a succession of one or more grits. On the other hand, the high speed production plant will require a setup to produce the desired surface with a single pass.

Abrasive Belts . . .

The selection of the abrasive belt or belts for a given sequence is one of careful consideration due to the many tangible and intangible factors that present themselves. The steel itself is a major one. The degree the steel may be pitted, laminations, hot or cold rolled, pickled or blasted, surface hardness, grain size, whether rimmed or aluminum killed, drawing ability and others—all play important roles in the end product. Consultation with technicians in the steel making business have emphasized the many good ways by which steel may be made and the importance of these factors. This point is developed, for unless a reasonable working knowledge of steel is available, difficulty will be experienced in flat polish operations. By the same token, a working knowledge of what the abrasive belt is and how it performs is essential.

The abrasive belt is to be considered as a multitude of cutting tools embodied in a uniform compact flat surface. The suitable movement of the abrasive across the surface being abraded is the essence of belt grinding, or flat polishing.

The manufacturers of coated abrasive products have done a marvelous job in developing products to meet the operating conditions of flat polishing. However, the belt sequence selection still must be made with due regard to the material being worked and surrounding conditions of operation. The grain or grit adheres to its backing with suitable adhesives, singly or in combination. Atmospheric conditions have their effects in polishing operations to a varying degree, as well as contact pressure and other factors.

Aluminum oxide belts are always used for roughing and semi-finishing operations, with silicon carbide abrasives for the best in finishing. This is true regardless of backings or sizings. It must not be assumed that a given grit size will cut an identical pattern throughout its life. It has been demonstrated that a 60 grit aluminum oxide belt can and will cut a 5-micro-inch pattern if used for a sufficient length of time. This does not imply that a belt can be used indefinitely. Pattern change and wear are close companions, and must not be overlooked in efficient operations. Depending upon steel type being processed, abrasive belts of 80–100, 120 grit size are used for roughing

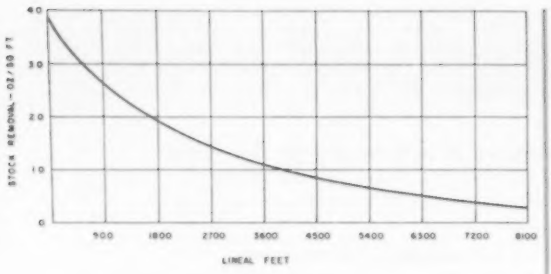


Figure 10

Average stock removal curve produced by 100-grit aluminum oxide belt operating at approx. 2 hp per inch of cut width

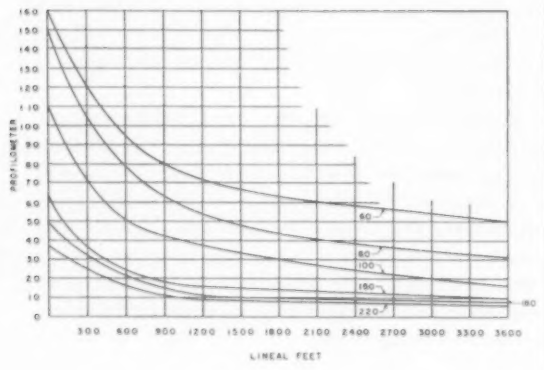


Figure 11

Comparison chart showing typical performance of various grit sizes. Produced with aluminum oxide belts operating at approx. 1.5 hp per inch of cut width

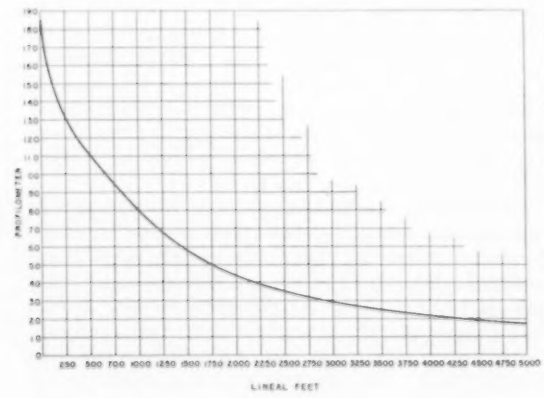


Figure 11a

Typical performance curve produced by a 100-grit aluminum oxide belt operating at approx. 2 hp per inch of cut width

Abrasive Belts (Cont'd)

operations. Grit sizes of 150, 180, 220 and 240 will be used for finishing. This does not mean that all grits are to be used, for the steel type processed and stock traverse speed will be the basis of grit size selected.

A large amount of technical data, covering the various phases of flat polishing is available. Not desirous of being considered contradictory, data coordination presents many problems. All heads in a line while operating alike, function differently, due to varying grits used, and progressive belt wear, not to mention the operating conditions from job to job. The scratch pattern of a given belt will vary in relationship to its wear or the amount of stock contacted. This necessitates generalization of data presentation, and can be refined when the particulars of any one instance are known.

Figures No. 10, 11 and 11a show typical and characteristic curves of performance, and are subject to some variation, depending upon functional operations.

In consideration of flat polishing, it should not be overlooked that the first pass or passes (depending upon the setup) are the work horses of the operation. This is where the major scratch pattern occurs with its consequent stock removal. Stock removal is a factor of the steel's physical characteristics and the surrounding conditions of operations, as well as for plating and similar surfaces seldom exceeding 0.002 inch. The subsequent passes to the roughing (25–100 micro-inches) are to bring the scratch pattern down to 5–8 micro-inches. With 0.002 in of stock removal, pits and laminations usually are removed, with the elimination of hand polishing after forming. Conditions of steel on hand may require additional roughing to remove defects but it is emphasized that flat polishing in no way should be regarded as a salvage operation. Rejects beyond 5 per cent after roughing is a matter to be taken up with the source of supply.

The micrographs, Figures No. 12 to 19 inclusive, clearly illustrate the scratch patterns from the rough 60 micro-inch to the fine 5 micro-inch. The steel samples, as polished, were nickel plated to preserve the surface accurately. After plating, the samples were cut and polished at a 45° angle for photographic purposes. The 45° sectioning provides greater emphasis to the scratch line than 90° sectioning would. As shown, all magnifications are 2500 diameters.

The micro photographs demonstrate what the scratch pattern actually is. With only the slightly rough surface, metal points project well up in the plating for an early breakdown. The fine finish shows smoothness of surface, elimination of metal fuzz, for a maximum of plate leveling. Measuring of the roughness with the profilometer; interpretation of results in terms of what the end product or plating sequence will or will not accept is the only correct method of procedures.

Exhaustive experimental work has demonstrated that

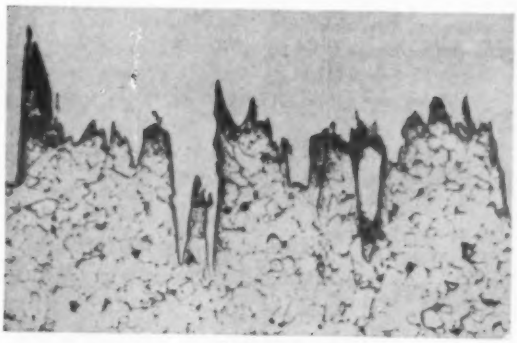


Figure 13

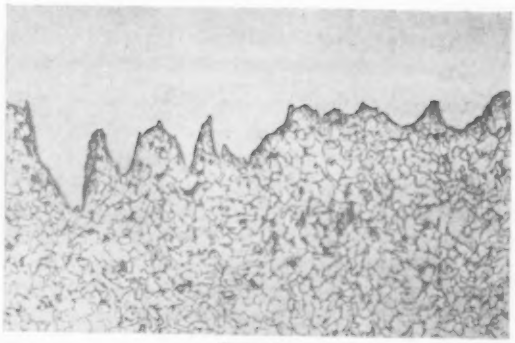


Figure 14

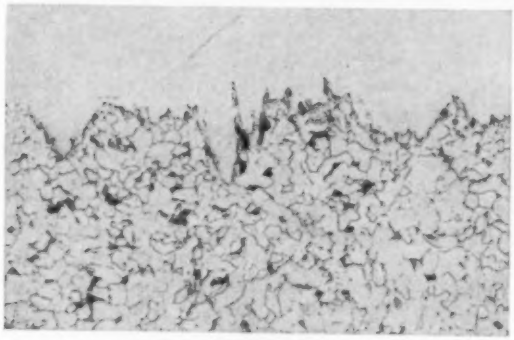


Figure 15

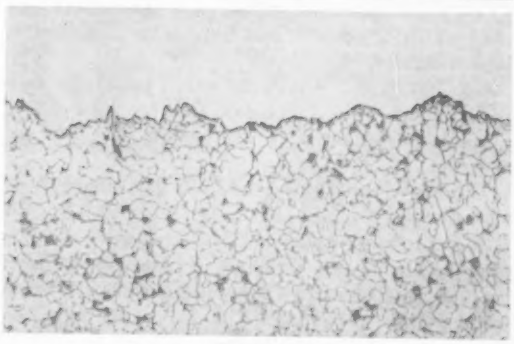


Figure 16

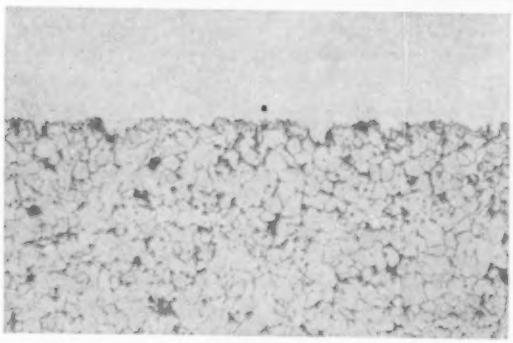


Figure 17

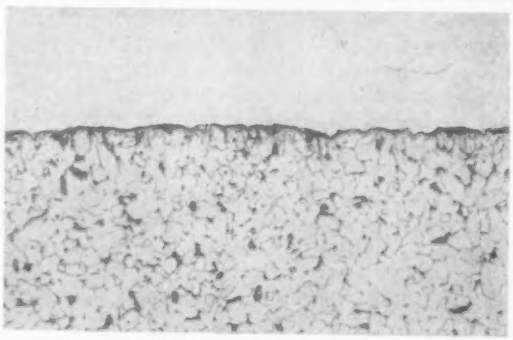


Figure 18

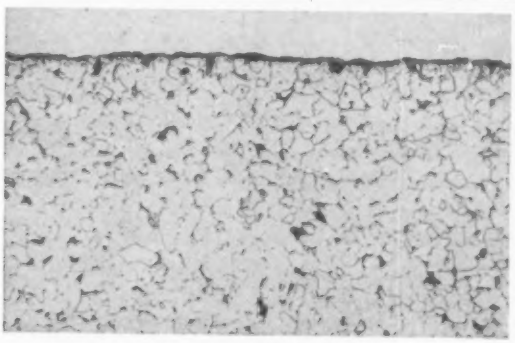


Figure 19

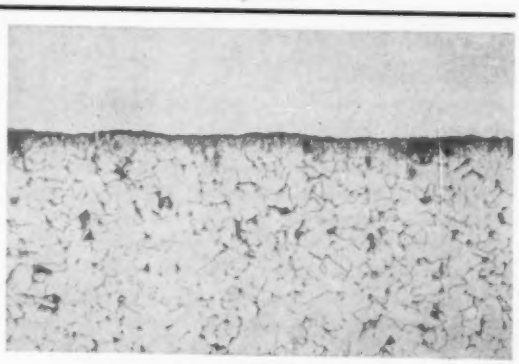


Figure 20

Abrasive Belts (Cont'd)

a 5–8 micro-inch finish provides a maximum of results with a minimum of plating.

Typical example of production operations:

Material Polished—S.A.E. No. 1015 H.R.S. (Pickled)
End Product—Automotive Bumpers
Line Traverse Speed—50 feet per minute
No. of Heads used—9 roughing
3 finishing
Type of Polishing—Wet.

On roughing heads 1, 2 and 3 are placed 100 grit aluminum oxide belts, and 300 sections of stock are passed. At the end of that time, the belts are replaced with new ones: with the partially used belts being progressed to heads 4–5 and 6.

When 300 pieces of stock have been passed, the belts are again removed and progressed to heads 7–8 and 9 for a similar production run. The belts at this point are discarded.

The roughness of the steel now will approximate 15–20 micro-inches.

On head No. 10 a new 150 grit silicon carbide belt is placed, thence to heads 11 and 12 in turn at 300 piece intervals, then discarded. The same procedure is followed with heads No. 13-14 and 15, with usage of 180 grit silicon carbide. At this point of polishing there will be obtained a finish of 5–8 micro-inches. All abrasive belts are cloth backed, X-weight, resin over glue bond and size, and single flexed.

The belt pattern as indicated, is not to be considered as the only one usable. Several variations are available with excellent results. However, only with silicon carbide and belt progression is the best in finish obtained, with uniformity and maintenance of scratch pattern with a high lustre. Any number of examples are available comparable in all respects to the one cited. They run the gamut of producing surfaces in a wide range of operations for many purposes.

Costs . . .

The costs involved in flat polishing are readily determined by the following procedures:

1. **Stock Removed:** Determined by weighing the steel before and after polishing, and reported as ounces per square foot. The usage of micrometers is inaccurate and not to be considered.
2. **Finish:** The finish as roughness in micro-inches.
3. **Stock Polished:** The amount of steel polished as square feet for a given time period.
4. **Abrasive Belts:** The number of belts used or discarded for a given time period.
5. **Cost of Coolants and Chemicals:** Used for a given time period.
6. **Cost of direct labor.**
7. **Utilities costs,** (not included in burden).
8. **Burden**

The balancing of the above factors will readily determine the accomplishments of the program.

Summary . . .

Summarizing the flat polishing program:

1. The polishing of steel has emerged from being an art and is now a precise, mechanical process.
2. Cost per square foot are very much less than any other form of polishing.
3. Capital costs are readily amortized, with lower costs per unit of end product.
4. Uniformity of scratch pattern is readily obtained and maintained.
5. The scratch pattern is acceptable to all forms of subsequent processing.
6. End products are uniform in appearance, with greater eye appeal.

Generally, hot rolled steel can be purchased and processed at a lower cost than the cost of cold finished steel.

The automation or the electrical and mechanical tie-in of all units and operations provide an economy never before attained.

GLOSSARY OF TERMINOLOGY . . .

HEAD: Flat polish unit mechanism, so constructed to allow sheet or strip steel to be passed through, and at the same time be surface ground by a selected abrasive belt.

PINCH ROLLS: Driving rolls on each side of contact roll to hold the stock at predetermined speeds and prevent skidding.

OSCILLATION ROLL: Top or centering roll holding abrasive belt in controlled positions and breaking up of polish line continuity.

CONTACT ROLL: Driven roll, operating belt to contact steel being ground.

BILLY ROLL: Bottom idle pressure roll, controlled by air pressure, positioning stock against abrasive belt as required.

SIDE IDLE ROLL: Adjustable belt tension roll.

MICRO-INCH: Unit of measurement equal to one-millionth of an inch.

PROFILOMETER OR SURF INDICATOR: Electronic instrument, employing a sensitive tracer arm indicating

roughness, and calibrated in micro-inches, being based on "Root-Mean-Square" (R.M.S.) and arithmetical average respectively.

WET POLISH: Usage of suitable coolant in polish operations.

DRY POLISH: No coolant used in polishing. Grindings removed by negative air pressure.

BELT LIFE: The length of time an abrasive belt functions efficiently and economically.

TORQUE LOAD: Electrical line load of drive motor and reported in horsepower per inch of belt width or directly in amperes of load.

AIR LOAD: Air pressure per square inch, actuating billy roll against steel being ground.

LINEAL LENGTH: The volume of steel in lineal feet produced per hour or other unit of time.

STOCK REMOVED: Amount of steel ground off, measured by weighing before and after operation, converted to thousands of an inch depth of cut.

SCRATCH PATTERN: Results of polishing after abrasive belt or sequence, as micro-inches.

ABRASIVE BELT: A uniform grit coating on paper of cloth backing, bonded and sized, cut and assembled to dimensions for a particular size of flat polish machine.

R. W. REDMOND was born in Sandusky, Mich. obtaining his grade and high school education in that community. Formal education was completed in 1918 at what is now the Michigan State University, majoring in chemistry.

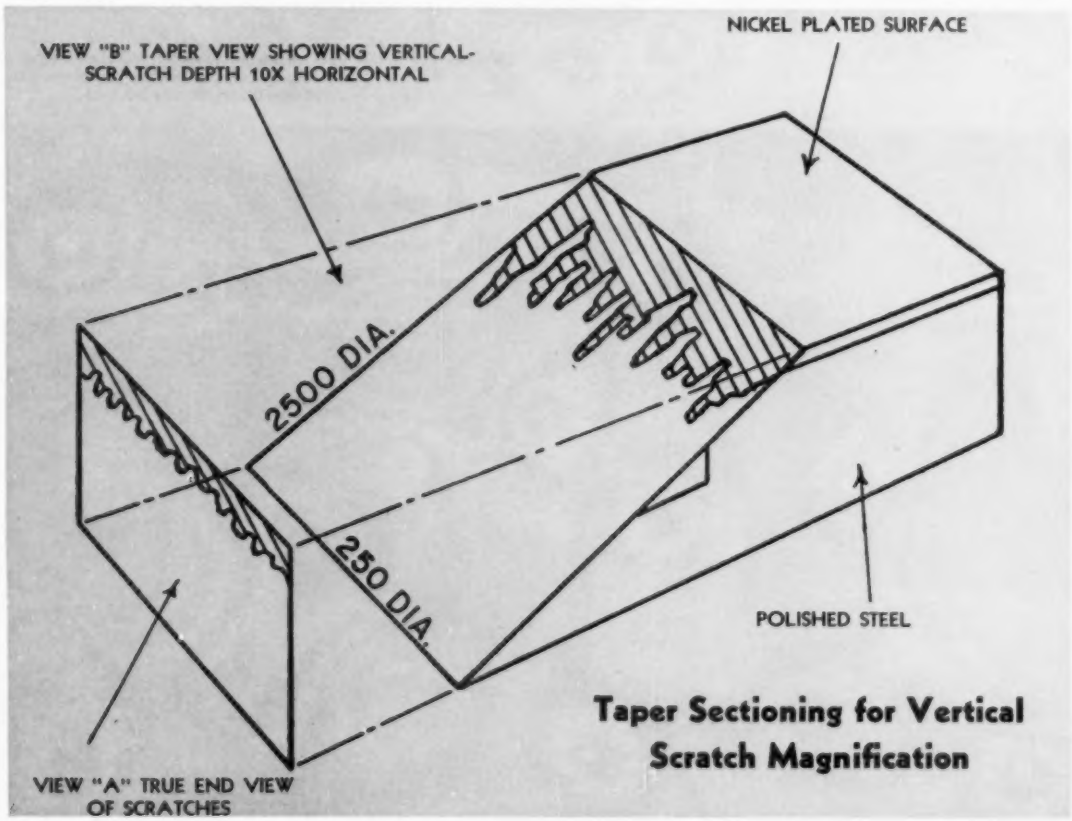
During the 1st World War, he did chemical control work in several major industries. The last 30 years he was associated with General Motors, Oldsmobile Div.—of this period, Chief Chemist for 15 years, the balance of the time as Project Development Engineer.

It was under Redmond's direction that the Sulfate Chromium Plating Bath was developed for commercial usage. Control methods and specifications now in wide use are a part of that development.

In 1938-39, the cold formed bumper bar was developed at Oldsmobile which was followed by the entire industry. Subsequent to World War II, flat polishing equipment became well developed with a major installation under his direction.

Redmond's work in this activity resulted in better abrasive belt selection accomplishing the now accepted processes of obtaining 5–8 micro-inch finish under high speed condition of productions.

Redmond accepted formal retirement in mid 1954 and since that time has acted as Engineer Consultant with the Murray-Way Corp. of Birmingham, Mich. He has long been a member of the AES, holding various offices in the Society.


VIEW "B" TAPER VIEW SHOWING VERTICAL-SCRATCH DEPTH 10X HORIZONTAL
NICKEL PLATED SURFACE
2500 DIA.
250 DIA.
POLISHED STEEL
VIEW "A" TRUE END VIEW OF SCRATCHES

Taper Sectioning for Vertical Scratch Magnification

USING BLAST CLEANING TECHNIQUES FOR CLEANING AND FINISHING . . . . . .

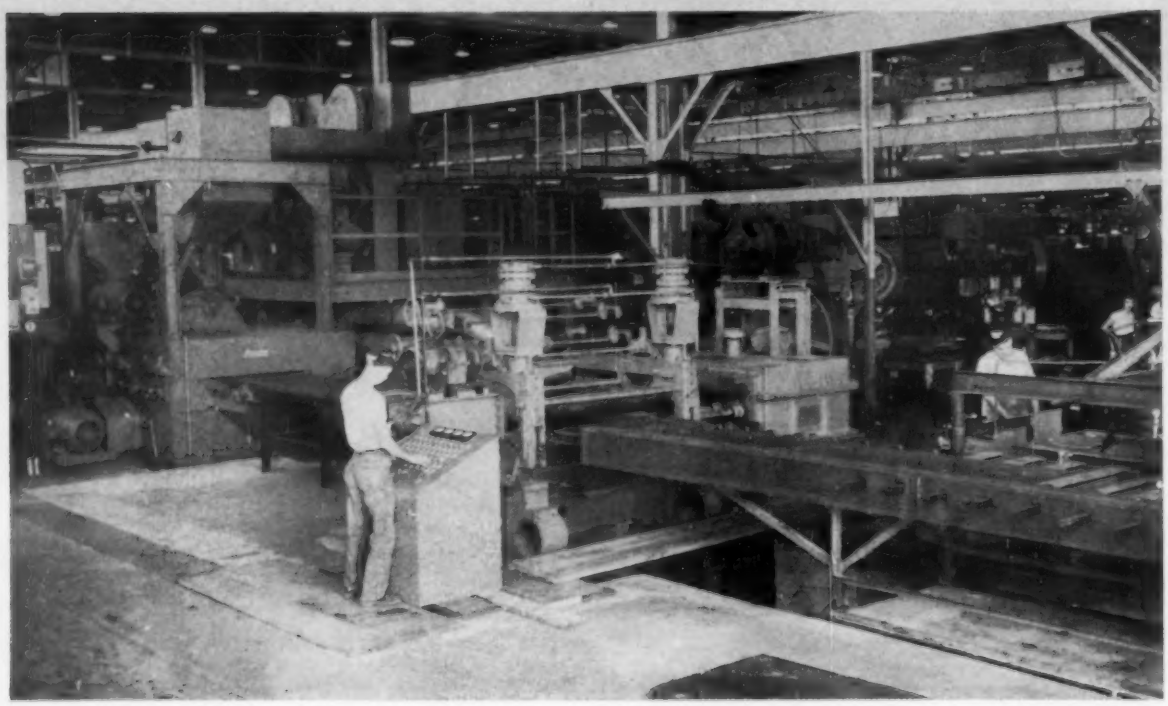
The different methods of abrasive blast cleaning have had frequent application in the plating industry. In recent years, more and varied uses have been found for the process. Although the primary purpose of blast cleaning has been the removal of scale from metallic surfaces and giving them bonding qualities, it is currently being applied also to such things as the deflashing and deburring of die castings before plating, the removal or blending of machine tool marks on all kinds of parts before plating, the elimination of considerable manual polishing, and the production of satin finishes.

In addition to reducing labor requirements, mechanical blasting has found increasing favor because it can be automated. As a result, work is done faster, finishes are more uniform, and cleaning is more thorough.

Blast cleaning has also replaced chemical cleaning in a number of instances. For one thing, it has no waste disposal problem. Plant working conditions are improved because there are no fumes. Blast cleaning of assemblies made up of different materials can be done without the need for gauging the cleaning time to a particular metal. Stampings, forgings, castings, weldments, and others can all be handled at once without overcleaning one and undercleaning another.

In addition, there are no problems due to "bleeding," which sometimes occurs after a cleaning operation. Blast

Cleaning hot rolled steel sheets at Atwood Vacuum Machine Co., Rockford, Ill., prior to cold forming and plating operations. View shows scale-covered sheets entering the machine



Part One

Dry Blasting

■ ■ **EUGENE F. ANDERSON***

cleaning requires less floor area in a plant than do chemical treatments. Maintenance on the plant is reduced. Blast cleaning in galvanizing has been found to reduce dross.

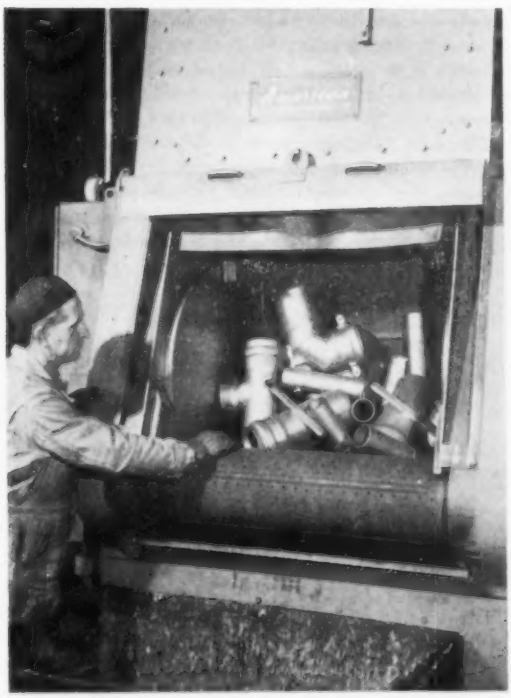
Abrasive blasting process is divided into two classes, dry blasting and wet blasting. The selection of the particular method depends mostly upon the nature of the work to be done and the quantity to be handled in a given time. In some cases, either the wet or dry method can be used, so a relevant factor in process adoption would be whether a piece of equipment using either method is already in the plant. Both the wet and dry methods are characterized by the throwing of abrasive particles at high velocity against the metal to be cleaned.

Here is a comparison of the weldments before and after blast cleaning at Irrigation Equipment Co., Inc., Eugene, Ore. Top item is scale-, flux-, and spatter-coated after welding. Lower one has been blast cleaned

There are two classes of dry blasting, namely airblasting and airless abrasive blasting. However, because of the quantities of work to be handled and the production rates that have to be considered in the plating industry, the airless abrasive blasting process is generally used when blast cleaning is specified. In this method, the abrasive particles are hurled upon the work by centrifugal force. This force is imparted by one or more rotating bladed wheels mounted strategically within the work chamber of the machine. The machines and work chambers are designed in various models, depending upon the nature of the work.

The centrifugal method makes it possible to blast over wide areas, so large quantities of small parts can be blasted per batch, with only a short time of processing required per batch. In the case of larger single components or work like steel strip, the principle is the same, regarding surface area cleaned and time of cleaning. Further, this method of propelling the abrasive is automatic,

* *Special Engineer, Wheelabrator Corporation.*



A tumble-blast type of blast cleaner surfaces weldments for hot dip galvanizing and bright zinc electroplating at Irrigation Equipment Co., Inc., Eugene, Ore. This load was blasted 10 minutes

so no operator is required to attend the machine during the actual blasting period. Automatic work conveyors are employed to turn parts in the blast, so that all areas of all parts receive the same amount of cleaning. Steel shot and grit are the most commonly used abrasives, although some non-ferrous metals are sometimes used, and occasionally, a nonmetallic soft-grit abrasive.

DESCALING HOT ROLLED STEEL FLAT STOCK

Probably the fastest growing application of blast cleaning at the present time is the descaling of hot rolled steel products, like strip and sheet, prior to forming and plating or galvanizing. Hot rolled structural steel is also being handled before galvanizing. All these things can be blast cleaned and plated or galvanized without the need for subsequent pickling; however, if the hot rolled steel is to be cold rolled or cold drawn prior to the application of the coating, a short acid passivation must be given after the blast cleaning. This removes some amorphous metal that would otherwise break down during the cold rolling and create smut.

A west coast manufacturer of electrical conduit takes hot rolled carbon steel strip that is 36 in, 40 in, or 48 in wide, blast cleans it, slits it, forms it into conduit, welds it, and electrogalvanizes it without acid passivation. Cost of cleaning the strip by shot blasting is in the neighborhood of 60 cents a ton, a fraction of the acid pickling cost. Blast descaling causes virtually no metal loss, whereas acid pickling generally consumes about 1½ per cent of the virgin metal.

DEFLASHING, DEBURRING

Another application in which blast cleaning has saved much money is the deflashing and deburring of die castings. Here, particularly, much manual labor and expense are saved. In addition, it has been possible to detect die casting porosity and surfaces on which adherence would be faulty due to surface "laminations." These laminations are shown up as blisters on the surface, after the blast deflashing operation.

The blasting process produces a matte-type surface on metal, an excellent bonding surface. However, if a mirror finish of plate is desired, it may be necessary to buff some. This is usually a minor operation, because a matte surface is perfectly uniform, with no directional lines, and a lustre quickly comes up.

DESCALING FABRICATIONS

A less spectacular but more commonly met problem is descaling fabricated components. A typical case is that of an Oregon manufacturer of welded couplers and fittings for sprinkler irrigation. He was cleaning these of their scale, flux, and spatter by chemical means prior to hot dip galvanizing or bright zinc electroplating, but switched to sandblasting. This last proved to be too slow for the requirements of the shop, so was replaced by automatic airless blasting. He cleans 5-cubic-foot loads of parts in only 10 minutes' time per load.

Airless blasting almost eliminated another operation. Due to the nature of the steel tubing in use, it had been necessary to pickle all weldments for about an hour prior to galvanizing to remove a particular wax-like corrosion inhibitor from the mill. After blasting was adopted, pickling time was cut to an average of only five minutes.

Since mechanical blast descaling produces a much cleaner surface on the weldments, a much more severe and critical inspection of all welds can be made prior to the galvanizing. It formerly was difficult to visually observe pit-holes or small "blows" that occurred during welding, as these small holes were hidden by slag deposits. Better inspection has materially improved the quality of the final product.

DIFFERENT METALS ASSEMBLED

A more serious situation was met by a Canadian manufacturer of pole line hardware in pickling surfaces of parts like clamps, turnbuckles, safety clips, lock washers, bolts, and hooks, for galvanizing.

One problem consisted of the "bleeding" of chemically cleaned parts after the galvanizing operation had been completed. Acid pickling usually requires some fluxing of the parts. And flux becomes troublesome by working into crevices and joints of riveted or assembled parts, only to run out after the galvanizing is performed. These parts need to be reworked.

The second problem involved the cleaning of assemblies of two or more dissimilar metals. Each type of metal and kind of component subjected to acid requires a certain time of treatment, of course; but the time varies from component to component. Frequently with two dissimilar components in one assembly, one is over pickled, and the other is underpickled. This means either a costly loss of metal on the first or an unsatisfactory surface on the other.

A switch to airless abrasive blasting solved both these problems. All metal assemblies can be subjected to blasting without overcleaning some sections and undercleaning others. A forging assembled to a malleable casting, for instance, is no problem. Welds of irregular surface can be cleaned as easily as the flat metal, so 100 per cent coverage with the zinc is achieved in that case also.

The same blasting process permits this company to remove forging scale on forged parts before using the trimming dies, thereby prolonging the lives of those dies. Burned-in sand as well as the usual kind on castings from shakeout is scoured away, thereby eliminating rejects due to that cause.

PERFORMANCE DATA

The figures on the case are interesting. Approximately 20 per cent saving in labor was made on the pickling process, itself, and approximately 80 per cent saving on changing acids and making general repairs to the pickling tanks. Over a six-month period, nearly $500 was saved on acids. Of more importance is the cost per ton of metal. In a six-month period of acid pickling, the total cleaning cost per ton of metal, excluding labor, was $1.57. In a six-month period during which blast cleaning was done, the cost dropped to $1.04 per ton, a saving of 53 cents per ton.

This company uses a tumble-blast type of blasting machine with a load capacity of 5 cu. ft of parts.

Part Two

Wet Blasting

In the wet blast cleaning method, the abrasive particles are very fine mesh ones, ranging from 80 to 2500 mesh. As a result, they need to be suspended in water, and the entire slurry mixture thrown at the work. Nonmetallic abrasives are used. Some are natural mineral materials, some are vegetable materials, and some are synthetics. The abrasive particles are kept suspended in the slurry by means of compressed air or a pump, and the complete mixture is propelled toward the work by means of a gun using compressed air.

Although in many applications this type of equipment is manually operated, with a workman positioning the work inside the cabinet through armholes and directing the abrasive gun toward the work, automatic wet blasting equipment has been designed for meeting high production schedules. These have special work conveyors and gun-holding mechanisms. With one abrasive gun, cleaning speeds up to around 200 square inches of surface per minute are achieved on zinc and aluminum. On steel, the rate would be about one-half as much. Naturally, the more guns that are employed, the faster is the cleaning.

BLASTING TOOLS

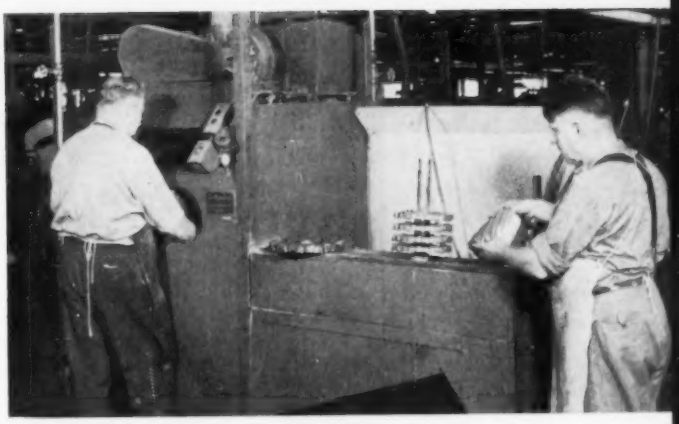
One of the more frequent applications of the wet blasting process is in tool plating. These tools may be new ones or used ones undergoing plating to restore lost tolerances. Wet blasting is applied twice during the procedure, before plating and after.

A number of advantages are realized when wet blasting is performed on tools prior to plating. It removes any fine wire burrs or feather edging which might be left on the cutting edge from the sharpening operation. These burrs and "feathers," of course, would otherwise become plated. They sometimes chip off later while the tool is being used and take the plating with them. Wet blasting, while deburring, leaves a matte-type surface on the tool. This gives a very strong plate-to-metal bond, because of the increased surface area.

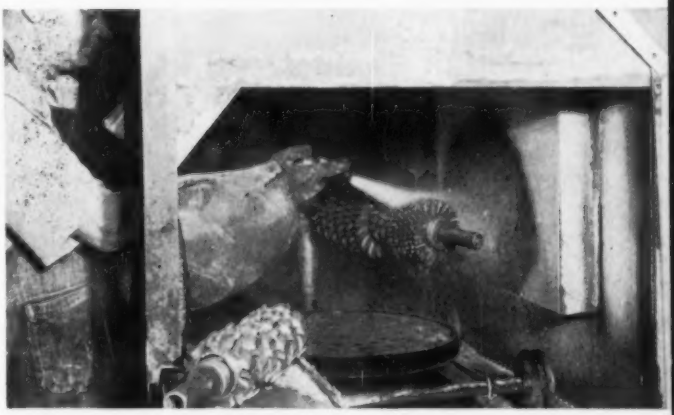
IMPROVES LUBRICATION

The blasting after plating is done so that a tool will have good lubricant-retention properties the minute it is put into service. On smooth chromium plated surfaces, lubricating oil has a tendency to bead up, so that a tool wets unevenly until it has been used for some time and "broken in." In contrast, a matte surface wets evenly with oil right away, so friction isn't much of a problem. Chips of metal cut during such operations as drilling and reaming, for instance, are rapidly eliminated through the flutes of the tool. As a result, the galling frequently experienced during, say, the cutting of plastics or nonferrous metals is reduced. Tool loading in cast iron machining is reduced.

Besides providing a better surface than other methods,



Wet blasting machine in the tool reconditioning shop of Goddard & Goddard Co., Detroit, Mich.



Interior of the wet blasting compartment of the machine shown in photo. Arbor holds many tools at once in the blast

Airless blast cleaning of metallic parts prior to galvanizing at Line and Cable Accessories Ltd., Toronto, Ontario, Canada. Blast chamber has five-cubic-foot capacity

A small Indiana shop uses this machine to blast tools before and after plating, in a reconditioning and rebuilding operation. Here we see a small broach blasted

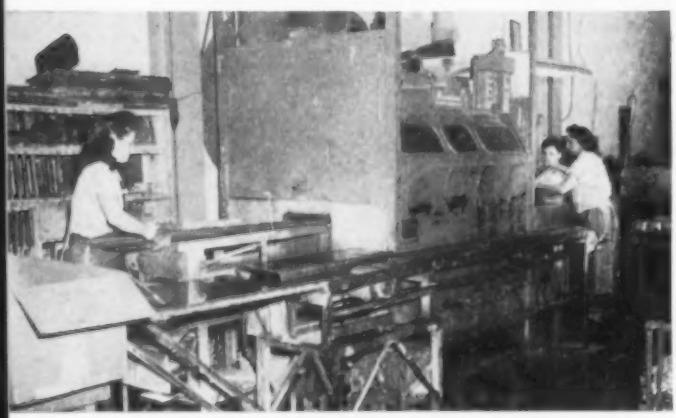
wet blasting surfaces much faster. Some platers have experienced savings on individual finishing operations ranging up to 80 per cent, due to it. One Indiana company which had been surfacing its tools before plating by pickling and wire brushing found that wet blasting made it possible to fixture and surface 25 drills, for instance, in the same time it formerly took to do only 5 or 6. Similar savings were realized on other parts. Since neither of the former surfacing processes was adaptable to finishing after plating, the benefits of wet blasting then were considered wholly as a bonus.

MAKES TWO-TONE FINISHES

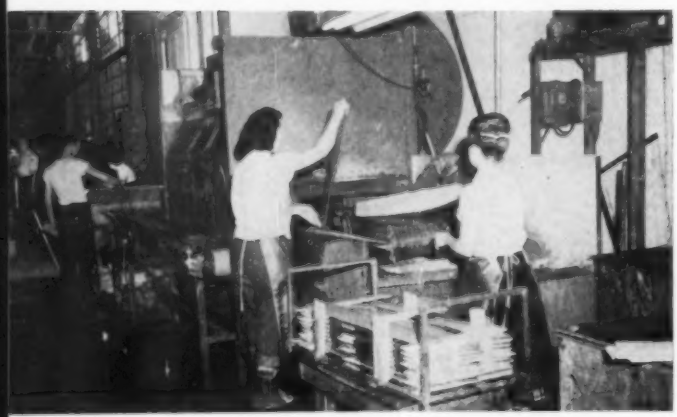
One of the newer uses of wet blasting is preparation of two-tone finishes for plating, as done with decorative hardware. Normal plating of die cast zinc, for instance, if it were previously all polished, would produce a mirror-like finish. To get a two-tone effect, a less reflective satin finish is put on some areas of parts.

Upon the advent of two-tone finishes, buffing was tried, for producing the satin finish, but it didn't meet requirements too well. First, it was a manual operation and therefore too time-consuming for the thousands of parts in a given production run. It gave inconsistent results and so was expensive in terms of quality control. It was hard to do with any but relatively flat parts, having no intricate contours and sweeping radii.

Wet blasting works nicely because it is mechanical, provides a non-directional finish, blends surface blemishes, and is speedy. It produces the same result time after time, and is not limited to parts of any particular shape. A special abrasive with a round particle character is used. This retains the bright lustre of the metal at the same time the satin matte finish is obtained. Parts that are to be plated with a mirror finish are masked from the blast.



Wet blasting to produce two-tone finishes on aluminum or zinc prior to either anodizing or plating at Nameplate & Monogram Co., Wapakoneta, Ohio. Top view shows the work being inserted into the automatic blasting chamber. Lower view shows the blasted material being removed as it emerges



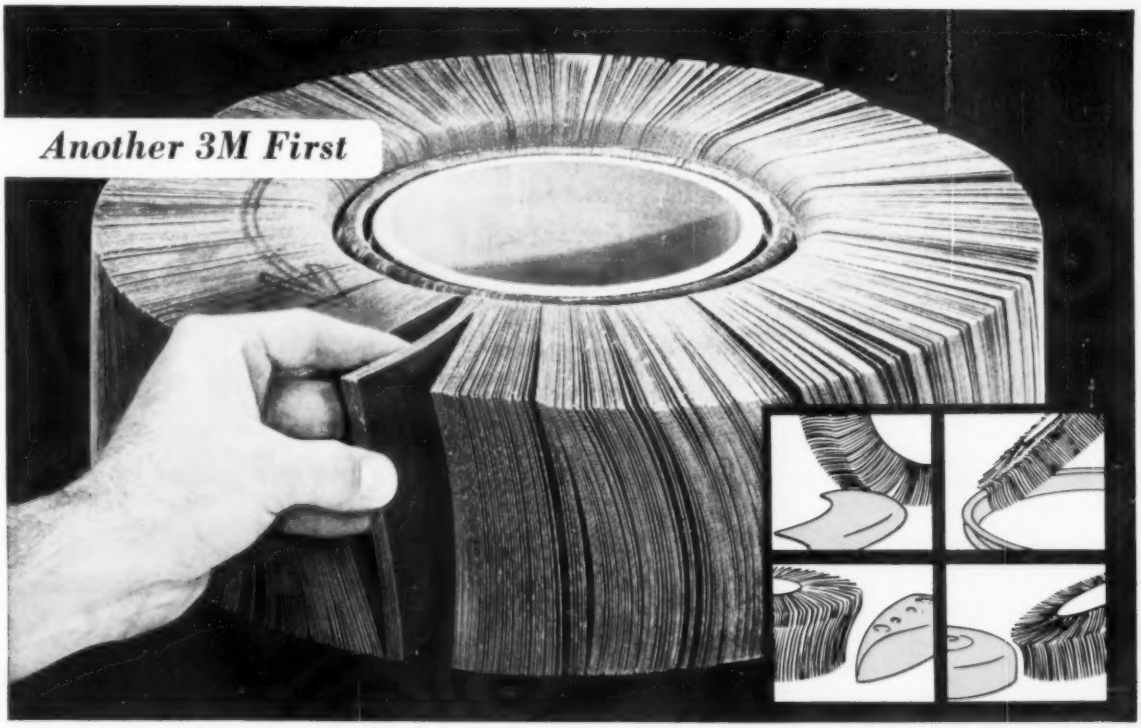
REDUCES GLARE

Reduction of glare on plated parts has been another frequent application. This is desirable on precision instrument dials and similar pieces where glare increases the chance for errors in reading. Some platers apply the process before plating, while some prefer to do the blasting after. In either case, the matte surface imparted does reduce glare.

EUGENE ANDERSON

Eugene Anderson is Special Engineer for Wheelabrator Corporation. A chemical engineering graduate of Purdue University, he was at one time Quality Control Laboratory Supervisor at Plaskon Div., Libbey-Owens-Ford Glass Co.

During the past several years, he has contributed frequently to technical magazines, authoring over 50 articles on metal cleaning and dust control.



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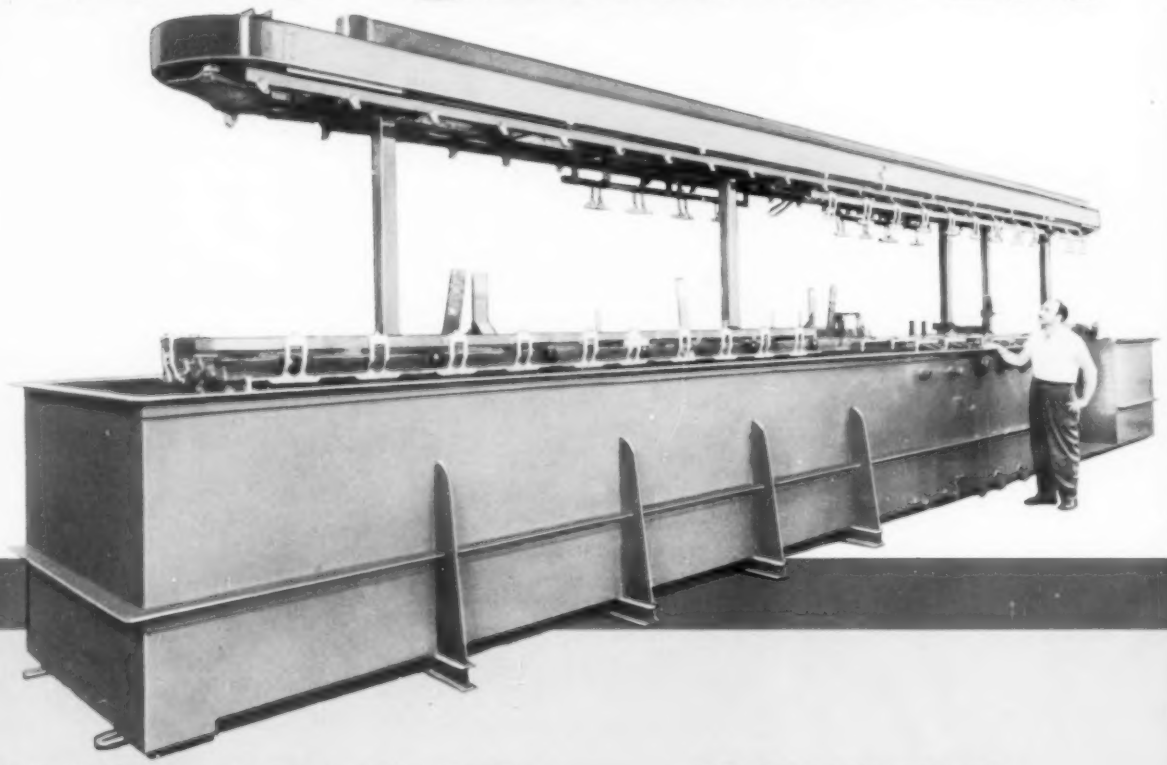
THE CYCLEMASTER



The Udylite Cyclemaster is a new, completely automatic plating machine which offers the greatest production of any machine built with comparable floor size. It is the result of over two years of research and experimentation, and incorporates the famous Udylite features of construction and engineering which are so well accepted in the plating industry.

A VERSATILE, STANDARDIZED MACHINE

The Cyclemaster is a standardized machine. Overall length, width and height of the machine, and depth of tanks, are standardized. This permits lower manufacturing costs with the benefits passed on to the user. The lengths of the various process tanks are changed to accommodate the rack size and the desired cycles of plating or processing in this machine. This means high production plating with a low initial machine cost.

WILL HANDLE MOST PLATING CYCLES

Ideal for cadmium and zinc plating, the Cyclemaster can also be used for copper-nickel-chrome plating and other processes where the cycle will fit into its 41 foot, 6 inch length. It will easily handle 120 racks per hour and take a rack size up to 16 inches by 36 inches. Every phase of the cycle is adjustable and its performance provides perfect uniformity in the plated product. Before building the Cyclemaster, The Udylite Corporation made a survey of the plating industry which shows that this machine will meet the requirements of over 50 per cent of the plating work in shops throughout the country.

ONE MAN CAN OPERATE

Being fully automatic, the Cyclemaster does not require the constant attention of experienced platers. Its operation is so simple any regular shop man can keep it operating at full capacity. One man can handle both loading and unloading.

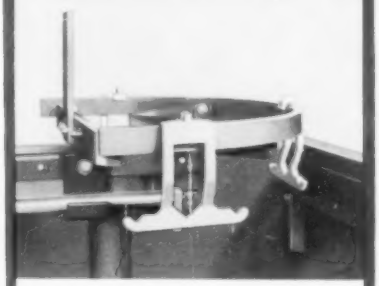
NEW MULTI-PURPOSE CARRIER

All Cyclemaster units are equipped with a new, standard multi-purpose carrier, which can be used for double spline or single spline racks. Made of special alloy metal, it has high structural strength and highest conductivity. The Cyclemaster carrier can also be easily adapted to inside anode plating if required.

HAS FAMOUS UDYLITE FEATURES

Like other Udylite machines, the Cyclemaster is completely assembled at our plant and run in before being shipped as a complete unit . . . rack spacings can be varied in individual tanks . . . machine is operated by hydraulic mechanism permitting variable speeds for lift, lowering or horizontal movement of racks in and out of solution . . . tanks, which are ventilated, have shields over them which permit a reduction of the amount of air exhausted to the outdoors, cutting down fuel consumption . . . through the simple one-piece cast carrier the current travels only 6 inches from the cathode rail to the rack . . . there are less moving parts on all Udylite machines than on any other type on the market . . . horizontal transfer of the work carriers is accomplished by a simple tee member pusher mechanism that is hydraulically operated . . . *no* chains are used for horizontal work transfer.

by UDYLITE FOR HIGHER PRODUCTION LOWER COST PLATING



Special alloy metal carriers have high conductivity and will take one or two splined racks.

Compact design requires a minimum of floor space. The Cyclemaster is only 41 feet 6 inches long, 7 feet wide.

EASILY SHIPPED AND INSTALLED

Built on a rugged 4 inch I-beam base, the Cyclemaster can be shipped as a complete unit, or if desired, in two sections, which require only bolting of the two sections together. This permits easy shipment by either truck or rail flat car.

DELIVERY

The standard machine (which is ideal for cadmium or zinc) with 14 inch by 36 inch rack is carried in stock for immediate shipment. However, because of standardized design, excellent delivery can be made even on Cyclemasters where a special processing cycle is required.

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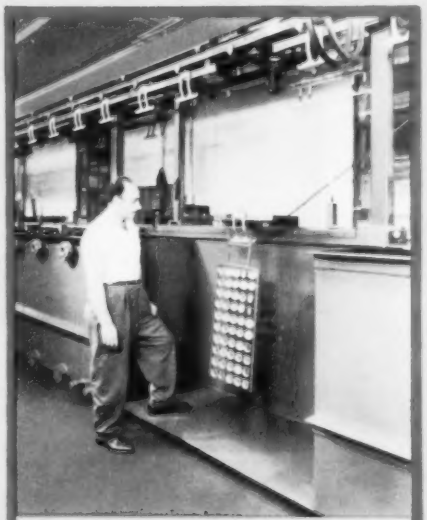
For more details regarding the Cyclemaster—or any other Udylite equipment—consult your local Udylite representative or write today to The Udylite Corporation, Detroit 11, Michigan.



Variable rack spacing allows ample room for load and unload—side load or end load available—one man operation.

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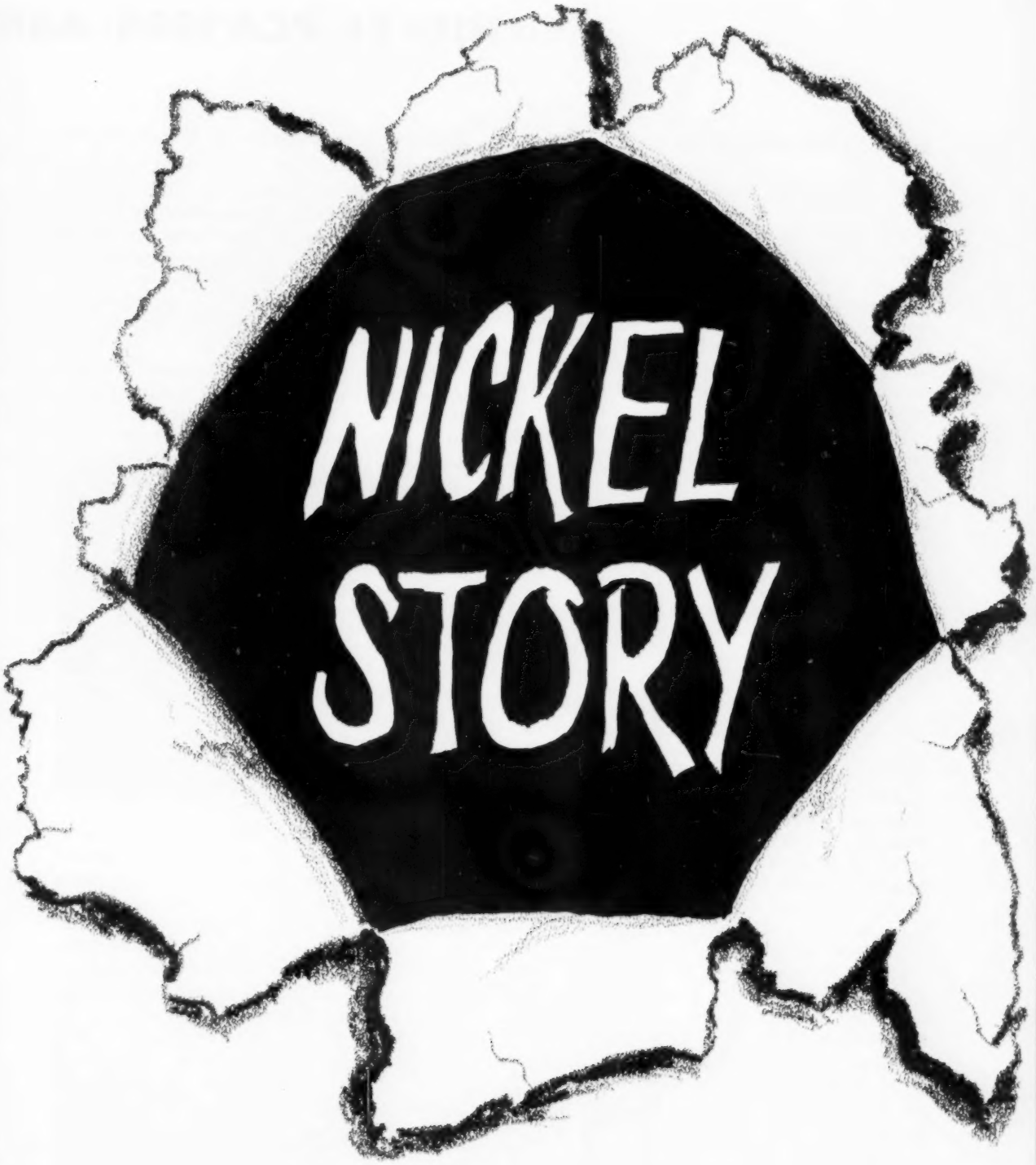

NICKEL
STORY

NICKEL PLATERS ASK

by P. PETER KOVATIS

The symphony of nickel—or the lack of it—was presented in Detroit on December 2 under the auspices of the Detroit branch of the American Electroplaters' Society. The tune was the same, but the music was louder and far from soothing to nickel-plating users who urged a Congressional investigation into "gray market" operations and an "inequitable" allocation of nickel.

Hub of the automotive industry and where are located principal users of this "scarce" and "precious" metal, Detroit was probably a most logical setting for the airing of the current nickel problem. The "critical shortage" of nickel, however, extends beyond the automotive industry, according to metal finishing experts. In the electronics industry for example, H. L. Hoffman, industry spokesman, reports that the nickel problem threatens to curtail production of receiving tubes and hamper the entire industry.

Facing a panel of nine—representing the Detroit press and leading automotive, metal market and financial publications, were the following plating and metal finishing industry spokesmen: Clyde Kelly, President of the American Electroplaters' Society; John A. Palik, Jr., President of the National Association of Metal Finishers; James Mueller, Executive Secretary, Plating Institute of Michigan; Dr. A. Kenneth Graham, president, Graham, Crowley and Associates; Herman B. Director, Staff Advisor, Industrial Raw Materials and Stock Pile, U. S. Department of Commerce; and Herberth E. Head, Third Vice-President, American Electroplaters' Society and of the Automotive Body Division, Chrysler Corporation.

The press conference planned by John Drinkwater, branch publicity director, was held in the afternoon. In the evening, Messrs. Palik, Graham and Director presented talks on the "nickel story" before more than 300 who attended the annual educational session. AES President C. Kelly presided over the evening affair which was arranged by branch librarian Doug Thomas.

Kelly cited the need for a more concerted effort by the plating and metal finishing industry to obtain swift corrective action in the current nickel problem. "We must not only obtain the proper amounts of nickel which we need," said Kelly, "but something should be done to apprehend and to take action against 'gray market' operators."

According to Palik who operates his own plating shop in Cleveland, "the plating industry has turned into a multi-billion dollar bonanza for unscrupulous 'gray market' operators." He pointed out that "each car being plated with 'gray market' nickel is costing an additional $8 to produce, and, assuming that 1955 will be an 8-million-car-year, if every car produced is plated with 'gray market' nickel, the automotive companies, plating companies and car buyers will be paying an additional $64 billion for cars."

U. S. Department of Commerce spokesman Director urged platers to report "gray market" operations to the proper authorities promptly. He said that the government operates 13 offices in the major industrial centers of the U. S. for the purpose of investigating malpractices. Director emphasized that the allocation of nickel was "fair to everyone" and charges of "inequitable allocations" were exaggerated.

Dr. Graham stated that there are no satisfactory substitutes for nickel. He suggested the following corrective measures: (1) obtain a realistic evaluation of actual present day requirements of all nickel and end-use industries; (2) seek a reallocation of nickel to end-use industries according to today's needs and not as of the Korean War period; (3) organize all users of nickel-plating so as to be able to accomplish objectives of the industry and to protect their interests; and (4) conduct an impartial investigation into the present system of nickel distribution.

James D. Mueller declared that unemployment was on the increase among his thirty member plating firms because of their inability

CONGRESSIONAL ACTION

to obtain enough nickel to plate bumper guards, inside and outside door handles and trim. He cited the need for Government regulations "to see that the nickel does not fall into the hands of 'gray market' operators."

Herberth E. Head of the Automotive Division of Chrysler Corporation pointed out that "bumpers were receiving full specifications but that it was very expensive under present nickel shortage."

Complete texts of talks follow:

Plating Staff Photo

"Nickel Story" Press Conference— Photo shows local scribes and editors of other publications interviewing H. E. Head, A. K. Graham, C. Kelly, J. A. Palik, Jr., and H. B. Director. Conference took place at the Detroit Statler under the auspices of the Detroit branch of the American Electroplaters' Society on December 2

Plating Staff Photo

Detroit AES branch Annual educational session participants —l to r: Dr. A. K. Graham; H. B. Director, AES President C. Kelly; branch librarian D. Thomas, and J. A. Palik, Jr., president of NAMF

J. A. Palik's, Dr. A. K. Graham's and H. B. Director's Views as Given at Nickel Conference

STATEMENT OF JOHN A. PALIK, JR.

President, National Association of Metal Finishers

What is the impact of the nickel shortage on the electroplating industry? Inasmuch as I represent the job shop platers throughout the country, my comments are directly concerned with this group. We all know that the entire plating industry has been seriously affected by an insufficient supply of nickel. However, as far as the job shop plater is concerned, he has been seriously hurt. You all know that you can't run a business if you only receive 25 per cent of your supplies. It means, too, that many people were let go; that the individual or corporation with thousands of dollars invested is not obtaining a just return.

We have found it difficult to place the blame in any one place for the existence of a vast "Gray Market" in nickel and for the inequitable distribution quotas which now exist.

However, this much is certain: there is a huge, multimillion dollar "Gray Market" in nickel, and there are glaring inequities in the quotas now in effect. Both of these factors are working a tremendous hardship on the plating industry and even on some of the large automobile manufacturers who do a great deal of their own plating.

As always, this "Gray Market" is causing the consumer to pay through the nose. Since the plating industry must pass the cost of "Gray Market" nickel on to the automobile manufacturers and the manufacturers must pass at least a part of this extra cost on to the consumer, car buyers are indirectly forced to pay financial tribute to the unscrupulous "Gray Market" operators.

Even those who defend the present system of distribution admit that at the very minimum, one third or about 35 per cent of all nickel used by the plating industry is coming from "Gray Market" sources at prices ranging from $2.50 to $3.50 per pound as compared to the $0.92 per pound price of nickel purchased through legitimate sources.

In Detroit, some of the plating companies complain that they are being forced to secure as much as 75 per cent of their nickel supply at higher prices, as opposed to only 25 per cent which they are able to purchase through legitimate channels at the legitimate price.

Averaging these extreme hardship cases with the admitted minimum, it is only a matter of simple arithmetic to arrive at the conclusion that the plating industry has turned into a multimillion dollar bonanza for unscrupulous "Gray Market" operators.

The automotive industry and its suppliers, and thus the car buyers, are being bilked out of from $21,000,000 to $98,000,000 in 1955 alone by these manipulators—depending upon whose figures you accept.

These figures are determined by this method: an average of four pounds of nickel goes into plating on a passenger car. At a "Gray Market" price of from $2.50 to $3.50 per pound, it is believed that the average overprice for nickel would amount to about $2.00 extra per pound. The four pounds of nickel on a car means that each car being plated is costing an additional $8.00 to produce. Assuming that 1955 will be an 8,000,000 car year and that every car produced is plated with "Gray Market" nickel, the automotive companies, the plating companies and/or the car buyers are paying an additional $64,000,000 for cars.

But let us take the "Gray Market" figure of one third which is admitted by the defenders of the present distribution system. If one third of the nickel on cars is being purchased through these "Gray Market" channels, this means that one third of $64,000,000 or a little more than $21,000,000 is being paid by platers, automotive companies and/or car buyers as a tribute to "Gray Market" operators. If three-fourths or 75 per cent of the nickel used in plating for the automotive industry is coming from "Gray Market" sources, as some Detroit platers insist, then this means that three-fourths of $64,000,000 or $48,000,000, is being paid by platers, automotive companies and/or car buyers as a tribute to "Gray Market" operators.

I suspect that the true figure lies somewhere between the minimum "Gray Market" admitted by those who control the present system of distribution and the maximum hardship cases reported by some Detroit plating companies. But, by either standard, it is safe to assume that the nickel situation is costing plating companies, auto-

motive companies and/or car buyers somewhere between $21,000,000 and $48,000,000 a year.

Then there is the even more serious affect which this "Gray Market" is having on the plating industry, an industry that can be classified in the small business category. Some of the platers who have found ways and means to secure the necessary nickel to meet their contracts with automotive companies are able to exist only because they can pass along the extra cost of "Gray Market" nickel to the automotive manufacturers. But many others, who are less resourceful, have been forced out of business, thus losing their life savings and causing dislocation of many skilled, semi-skilled and unskilled employees. Since the backbone of our economy is admittedly small business, this is a problem which deserves sober thought and careful consideration in Washington.

What concerns all of us associated with the plating industry is why such a condition can be permitted to exist for more than five years. There has been a "Gray Market" and a serious shortage of nickel allotted to the plating industry during this period, while we understand that the steel industry has had sufficient nickel to meet its most optimistic requirements for processing stainless steel.

It is hard to believe that in this age of plenty there could exist for very long a real shortage in any metal, but it is even harder to believe that shortage could last so long and become so acute.

Imagine a "Gray Market" existing in a peacetime economy to the extent of from one-third to three-fourths of the total requirement. Something is wrong somewhere and we think it is time the finger of the government be pointed to the real reason behind this "Gray Market."

The mere existence of such a market indicates that almost enough nickel is being produced to meet the demands, but that because the demand is so nearly equal to the supply, the plating industry has become the victim of economic opportunists who are stuffing their pockets with dollars made from nickel.

Where does this "Gray Market" nickel come from? What attempt is being made to remedy this condition which has existed for more than five years? What is done to punish those found guilty of trafficking in "Gray Market" nickel? These are but a few of the questions we want answered.

I can tell you what our association has been doing in an attempt to secure relief from the shortage of nickel.

On September 2, 1955 numerous telegrams and letters were sent, on a national basis, to senators and congressmen requesting help on this problem. As a result of this action, replies were received from them, promising their cooperation. Mr. Director's office has been receiving numerous inquiries from these men.

On Friday, October 7, I met with Mr. Director, Mr. H. K. Herschman, of the Nickel Section, and Mr. Floyd, Assistant Director of ODM for Materials. We spent a few hours reviewing the nickel shortage, especially as it pertains to our industry. I might say that they were very cooperative and it was pointed out that they have endeavored to have Dr. Flemming, Director of Office of Defense Administration, divert sufficient nickel from the amount scheduled each month for the government stockpile, so that our industry would obtain relief.

During 1955, 21,750,000 pounds of nickel from scheduled shipments to the government were diverted to industry. Upon inquiry, it was found that the military and those engaged in defense programs obtained this diverted nickel. The job shop plater did not receive any for regular commercial plating.

We, of course, all know that our government comes first as far as defense of our country is concerned and we have been told that the diverted nickel was absolutely needed by the Military. If so, we will go along with that, but 21,750,000 pounds is a lot of nickel.

In addition to my meetings with the gentlemen in Washington, our association has committees meeting on a national basis, with representatives of those companies who supply us with nickel. As a result of these meetings, it has been suggested that the NAMF meet with a congressman for further assistance in obtaining more nickel.

Therefore, we plan to meet the early part of January, in Chicago, with representative Sidney R. Yates, of Illinois, a member of the House Select Committee on small business. He is very much interested in our problem.

I can assure you that the National Association of Metal Finishers will not stop in its efforts to obtain the nickel the industry is entitled to. We feel that five years is too long, and that we should be receiving a lot more than 25 per cent of nickel anodes, which is our present monthly allocation.

I would like to take this opportunity to thank the AES President, Mr. Clyde Kelly, for his efforts on our behalf. He has been obtaining information for our use and it has been very helpful.

We hope, after our January meeting, that we will be able to have something tangible to report to you. If anyone has information which will assist us in this program, I should appreciate hearing from him.

Those of you who receive our monthly publication *Finishing Touches* are kept up to date on what the NAMF is doing. We shall keep you informed through this paper of the results of our January meeting.

Incidentally, at our Cleveland meeting with the suppliers group, it was also suggested that perhaps Legislation by Congress on nickel should be made as follows:

> Anyone who resells any allocated nickel should be subject to a sizable fine and a certain number of years in prison.

We feel that this will eliminate the activities of those who have been selling nickel at premium prices. This certainly will be up for discussion at our January meeting.

Elusive Nickel!

ICKEL SHORTAGE TERMED CRITICAL

Industry Spokesman Urges Use of Stockpile Supplies to Avoid Heavy Cutback

(TIMES -- Dec 2, '55)

A "critical shortage" of nickel threatens to curtail production of receiving tubes and hamper the entire electronics industry, according to the president of the Radio-Electronics-Television Manufacturing Association.

The industry spokesman, H. Leslie Hoffman, disclosed that he had written to Secretary of Commerce Sinclair Weeks, requesting immediate action to relieve the supply pinch by diverting more of the strategic metal from delivery to the Government stockpile.

Unless more nickel is made ere cutback will oc- production of receiv- d of the full range equipment in which porated. This in- e the loss of skilled roughout the entire industry, reaching tions some months

Mr. Hoffman's letter

ckel Users Ask ray Market Quiz

ecial to World-Telegram and Sun.

DETROIT, Dec. 5.—Spokesmen for nickel-plating firms, charging they must buy 75 percent of their nickel from "gray market" operators at prices up to four times "legitimate rates," today urged a Congressional investigation.

"Nickel allocations are so "inequitable" that they are causing unemployment and barring some job shops from meeting customary specifications on such items as auto bumpers, spokesmen said at a conference sponsored by the Detroit branch of the American Electroplaters Society.

Herman B. Director of the U.S. Commerce Department held that the charges were exaggerated. He thought the allocation system was "fair to everyone."

Nickel Storm Brews

Platers assert famine comes from distribution patterns, not from shortage

DETROIT platers are buying as much as 75 per cent of their nickel at gray market prices—$3.50 a pound. Legitimate channels are getting 92 cents.

Adding up the cost for plating industry representatives at their recent Detroit meeting, John Palik, president of the National Association of Metal Finishers, figures gray market nickel is costing automakers a minimum of $21 million this year. His maximum estimate—$98 million.

Inequities—Some platers keep up by passing along the cost, others, while others have been put out of business. He believes the gray market covers one-half to three-quarters of total requirements.

Platers believe that the shortage is to be blamed on distribution patterns rather than on lack of metal. Dr. Kenneth A. Grabowley & Associates Inc., Pa., feels an investigation of sources of gray market nickel would prove illuminating.—"Unfortunately, we inherited in high temperature on from the Graham

Own Concern

of the association the bulk of the equipment produced ent of a large con- field, the Hoffman rporation.

that you give fur- ion to the impact shortage on the y of industry to ion requirements. der whether you ommend that add- f nickel be divert- e to vital indus- r. Hoffman wrote. was accompanied tlining the indus- requirements, ap- e executive com- association's tube

In this report it is estimated that the tube industry's nickel needs would average 262,000 pounds a month next year. If the industry had enough not developed conservation ma

requirements during 19 would be 600,000 pounds, the report noted.

Diversions Already Ordered

The Government has announced that 23,950,000 pounds of nickel originally scheduled to be delivered to the strategic stockpile have been ordered diverted to industry so far this year. In addition, the Government offered 1,100,000 pounds of premium-priced nickel to industry in both November and this month to help alleviate the supply squeeze. This premium

Black Marketing of Nickel Arouses Electroplating Industry

Corrosion of bumpers and other bright finished met work on cars and trucks lose their luster all to soo due to the scarcity and high price of nickel.

The disproportionately great cost and dearth of nicke is caused by large quantity stockpiling of the U.S. gov ernment to meet possible emergency military require ments, and black marketing of the metal. *The latter condition has the electroplating industry so aroused that steps are about to be taken to combat this evil.*

Congressional action is being sought to stamp out he malpractice. It appears that unscrupulous author- ed purchasers order beyond their requirements and l the surplus at several times its original cost. Car d truck makers are listed among the victims.

s is well known, nickel is an oxidizing inhibitor out a peer. The thickness of the applied coating is ssential r enduring quality.

ual pro try is to a suit even on st par kel; and a fla nd pro- fini the

Gray Market' In Nickel Cost Put in Millions

DETROIT.—A "gray market" in nickel is costing automobile buyers $21 to $48 million per year, it was alleged here last week during the annual education meeting of the Detroit branch of the American Electroplaters Society.

Representatives of business and government discussed the shortage. Very little nickel is mined in this country. Principal supplier is the Canadian International Nickel Co. American affiliate distributes metal in the U. S.

Herman B. Director, Commerce Department business and Defense Services Administration, said that some of the "gray market" prices that have been reported are "greatly exaggerated."

Auto industry spokesmen said nickel "pinch is real." Director's research, at least, has found that nickel can be eliminated except in high temperature alloys.

John Palik, president of the National Assn. of Metal Finishers, said: "We have been forced to place the blame for the existence of a vast 'gray market' on the shortage and for the distribution quotas.

Distribution practices, by Dr. A. Graham, Grahamstown, Pa., Jenkintown, Pa., would be responsible for black market metal distributed.

Palik said nickel prices are $2.50 a pound for prepared nickel on the gray market.

All this came out at a press conference sponsored by the Detroit branch of the American Electroplaters Society, where platers clashed with a Government official just how serious the nickel shortage is. Herman B. Director, Commerce Department's business and defense services administration, said that some of the "gray market" prices that have been reported are "greatly exaggerated."

Electro-Plating Fi Say Nickel Shortage Causes "Gray Market"

As Much As Four Times Normal Prices Reported Paid for 75% Of Some Firms' Supplies

By a WALL STREET JOURNAL Staff Reporter

DETROIT — The electro-plating industry charged there is a "gray market" in nickel and called on Congress to investigate.

Spokesmen for nickel-plating companies dis- closed they are being forced to buy as much as 75% of their nickel from "gray market" opera- tors at prices up to about four times the legiti- mate rates because they can't obtain enough of the metal from regular sources.

These firms also charged that nickel alloca- tions are so "inequitable" that it's causing un- employment in the industry and preventing some job shops from meeting their customary specifications on such items as automobile bumpers

The clippings reproduced here are from:

WARDS AUTOMOTIVE REPORTS
STEEL
WALL STREET JOURNAL
NEW YORK TIMES
AUTOMOTIVE NEWS
N. Y. WORLD TELEGRAM AND SUN

STATEMENT OF DR. A. KENNETH GRAHAM

President, Graham, Crowley and Associates, Inc., Plating Consultants and Engineers
Jenkintown, Pennsylvania

Mr. Palik has just called a spade a spade. I am going to call a spade a . . . shovel.

However, I do not want anyone leaving this room after hearing my paper to have the impression that I desire to be destructive. On the contrary, I desire to be constructive and to present the facts as I know them, in the hope that it will make possible an improvement in the nickel situation as it affects the electroplating industry.

I believe I can substantiate statements which I make in my paper; however, if any of them can be proved to be wrong, I shall be happy to be corrected.

Before speaking on the assigned subject, I must confess that I am disturbed by the necessity of talking about all plating as an industry when strictly according to definition it is not, since over 80 per cent of the plating is done in captive departments of various end-product manufacturing concerns, and the government has defined the remaining 15–20 per cent, i.e., the contract plating shops, as the industry.

I share the opinion of many that the use of substitutes for nickel plating might not be necessary if the distribution of the available nickel were made on a basis equitable to all end-use industries. Unfortunately, our industry has inherited the earlier inequity of distribution of the Korean period, whereby we received a much lower percentage of our base period quantity than other end-use industries. I fear this condition will continue unless the actual present-day requirements of all nickel using industries are realistically re-evaluated and then an adjustment in distribution is made accordingly.

An investigation of the sources of black market nickel also should prove illuminating in this respect. Our industry is obliged to purchase substantial quantities of black market nickel (i.e., all available) at a terrific cost and even then can not meet its requirements. It would appear to be the one industry being short-changed in allotment for this reason, and the largest users of nickel, the metallurgical industries, are not obliged to do this to my knowledge. Also, their activities in the black market over the years would be more generally known were this not so. But even this does not tell the whole story, since nickel allotted in excess of requirement to any group may be either stockpiled or sold on the black market. There should be no nickel available for the black market if it were equally distributed, and scrap were recast and reused, as is commonly practiced by the large plating users.

I have first-hand knowledge of the inaccuracies in estimating military requirements based upon my WPB experience; but, if the present rate of government stockpiling is greater than actually necessary, the factor of safety this may provide is for our collective security. However, if the plating industry in a peacetime economy is the only one to be strangled because nickel is not made available, then the distribution of available nickel should be questioned, rather than the stockpiling program.

Because I believe the present situation should not be as bad as we in our industry find it, I hesitate to encourage the use of substitutes by talking about them. Furthermore, published statements about substitutes for nickel, whether true or exaggerated, and no matter how unsatisfactory the substitute may actually be, can often serve to worsen our plight. Public servants and others with little or no plating background, even if free from selfish motives, cannot be too discriminating in their interpretations. The opinions cited by such individuals undoubtedly will continue to influence the thinking as to the necessity of nickel for plating, both in government and elsewhere.

In view of this, extravagant claims for substitutes for nickel plating can do our industry lasting harm, and a factual periodic review of the subject should be helpful. The facts as I know them are briefly these:

1. There is no satisfactory nickel-free bright chromium coating combination equivalent to conventional thicknesses of nickel-chromium for severe outdoor applications.
2. Electrodeposited substitutes for part or all of the nickel in most cases cost more than for all-nickel-chromium coatings and the quality is always lowered.
3. The use of supplemental clear organic coatings over electrodeposited substitute coatings does not give quality or performance equivalent to conventional nickel-chromium coatings and the cost may be increased.
4. Changes in treatment cycles, plating processes and equipment associated with the use of various proposed substitute coating combinations cause lost production time, are costly to make, and frequently are impossible because of space limitations.
5. If an amount of money equal to that already expended on the development of nickel processes were spent to improve the available proposed substitutes for nickel, they would still not be equivalent to nickel-chromium coatings in quality because the essential properties are lacking.
6. The nickel-free metal or alloy combination, which would equal or exceed the properties of nickel for protective and decorative coating applications in outdoor service, and could also be applied by electrodeposition, has not yet been developed.

There are other serious consequences of the present nickel situation which are wholly inconsistent with our concepts of free enterprise:

1. No company can get nickel to start plating its own products today if its name is not already listed as an established user of nickel.
2. Even if this company's products are currently being nickel-plated in job shops, this is still true.
3. Should the company substitute white brass, or something else, for nickel in order to do its own plating, the job shops presumably can still get the nickel, but not the company.
4. Supply houses to the plating industry have spent large sums of money on research in developing proprietary bright nickel and easy buff or levelling nickel processes. Some processes are preferred to others for given applications, or because of the properties of the nickel deposited. However, it is not uncommon for a user to select a process wholly on the basis of what supplier will give him nickel, rather than on the merits of the process. This is not free enterprise, and it is undoubtedly distasteful to suppliers and users alike.

In view of this dismal picture, one might properly ask which is most dependent upon nickel for its survival—the plating or the metallurgical industry?

One might also ask what substitutions the metallurgical industries have been obliged to make, if any, or how many metallurgical concerns have been obliged to radically alter their manufacturing methods or products because of insufficient nickel in comparison to what has been happening in the plating industry since World War II. Casual inquiry regarding one large metallurgical company has confirmed that they have not been obliged to practice substitutions and have been allocated ample nickel for their needs.

As for substitutions in the metallurgical industries, a case in point is the fact that the Germans because of a nickel shortage in World War II developed a non-nickel bearing alloy for a given application which is superior in properties to the 8 per cent nickel alloy used in this country. Since this information has been available over here, I have been advised that we are continuing to use nickel bearing alloys for this application, and that a 25 per cent nickel alloy is now claimed to have properties equivalent to the German alloy.

The basic reason for our dilemma is the fact that the users of nickel plating, including the captive plating departments, have never been organized in a manner to represent the industry as a whole so as to protect its interests. During both the second World War and the Korean affair, for example, the copper, zinc, lead, steel, and other industries were represented in Washington by government-appointed Industry Advisory Committees. These were consulted with respect to any orders or legislation affecting their industry. The plating industry was represented only by a job shop Industry Advisory Committee (approximately 15 per cent of the plating industry) during the Korean affair, and had no representation during World War II, the period during which the philosophy of how scarce materials were to be controlled and dis-

tributed was established. Furthermore, unlike copper, zinc, lead, and steel, nickel was not handled in a WPB division of its own, but by a section of the Alloy Steel Branch of the Iron and Steel Division. A similar arrangement continued through the Korean period in NPA, and in the Department of Commerce organization later. This meant that any decision involving the amount of nickel the plating industry received was determined within the Iron and Steel Division, which represents the largest nickel end-use industry. If the situation was reversed, one wonders how long the steel industry would have allowed the plating industry, in effect, to handle their allocation of nickel?

There is also reason to believe that this conflict in interest with respect to the nickel end-use industries exists within the nickel-producing companies themselves. The fact that The International Nickel Company is currently handling nickel allocations is no cause for optimism, since the basis for handling nickel originated with this company in the first place and the same philosophy for distribution appears to prevail today. To correct this situation our industry should endeavor:

1. To dispel the idea that nickel plating isn't necessary and that we have satisfactory substitutes for nickel,
2. To obtain a realistic evaluation of the actual present-day requirements of all the nickel end-use industries,
3. To seek a re-allocation of nickel to end-use industries on the above basis, and
4. To organize all the *users* of nickel plating so as to be able to better accomplish these objectives and to protect their interest.

In conclusion may I say it is not possible for me to accept the idea that our extensive plating activities can not be defined and organized in some fashion so as to receive the treatment accorded an industry.

Nor can I accept the idea that a truly representative group of the plating industry should not be able to initiate some constructive action. An impartial investigation of the handling of nickel is long overdue.

STATEMENT OF HERMAN B. DIRECTOR

Staff Advisor for Industrial Raw Materials and Stockpile, Business and Defense Services Administration, Department of Commerce, before the American Electroplaters' Society at Detroit, Michigan, December 2, 1955.

Mr. Chairman and members of the Electroplaters' Society, I am indeed grateful for this opportunity to meet with you to discuss the nickel situation as we see it in the Department of Commerce. This meeting is long overdue and I believe will be the first time wherein the Government and the electroplaters have met together to discuss the nickel situation. The reason why this has not been done before is very simple. This is the first invitation you have extended to us to meet with you and, of course, we are delighted to take advantage of the opportunity.

I would like to discuss with you the facts about nickel as contained in a series of charts which will be shown to you. These charts review the nickel situation in major industry groups, including electroplating, since it is important for each group to understand the total picture with regard to nickel in order to assess its own position in relation to other nickel consumers. Included in the charts is a description of the U. S. consumption and supply experience for the years 1946 through 1955 to date and a projection for the balance of 1955 and 1956. These segments include stainless steels, low alloy steels, non-ferrous uses, high temperature and electrical resistance alloys and electroplating. Included below is a description of nickel consumption experience in each of these fields.

A. Nickel Consumed in Stainless Steel in the U. S.

The actual consumption of stainless steel in the U. S. by years for the period 1946 through 1954 as reported by the Bureau of Mines is shown in Chart 1. The 1955 estimate is based upon actual figures as reported by the Bureau of Mines for the first 7 months of 1955 extended for the full year.

The 1956 figure of 100 million pounds represents the amount of nickel requested by industry for non-defense uses added to the Government's estimate of reported defense requirements for 1956.

As shown in the chart, the production of nickel stainless steels shows much less fluctuation than the actual consumption of nickel. Nickel stainless steel production has increased over the years reaching a peak period of production of 360,000 tons in 1955.

While the production of nickel chrome stainless steel has been fairly steady over the years the production of all stainless, including non-nickel-bearing stainless steel, is much more erratic. It appears, therefore, that variations in the over-all stainless shipments are directly related to steels other than nickel-bearing stainless steels. Thus, while stainless shipments dropped 149 thousand tons from 1953 to 1954, chrome nickel stainless shipments remained almost identical for 1952 and 1953, and increased a fraction in 1954. This comparison is described in Chart 2.

The total amount of nickel consumed in stainless steel with the exception of the depressed year of 1949 shows a steady increase over the years. This consumption reached the peak in 1952 at the height of the Korean conflict and has dropped substantially in 1953 and again in 1954. This drop in nickel consumption is explained in part by the change in nickel content in steels produced for military uses during the Korean War period.

The trend towards increased tonnages of nickel-bearing stainless steels was even more pronounced during the last part of 1954 and on through 1955 than had first been expected. Producers of stainless steel report that in order to stretch their nickel supplies as far as possible, they distributed to their customers and to industry generally, significant test data urging utilization by industry of leaner nickel grades of steel such as 4 per cent in place of 8 per cent nickel steels. Advantageous delivery conditions are quoted in order to stimulate customer interest in such products. The response to these measures has not noticeably influenced the demand for nickel-bearing stainless steel. This is explained in part by certain rigid laws, rules and regulations covering the use of 8 per cent nickel steels in such large consuming segments of industry as the Food and Dairy Industries. State laws almost uniformly require the use of 8 per cent nickel steel in handling equipment for food processing. Higher temperature and corrosion resisting requirements of electrical power, chemicals, petroleum, and other industries continue to demand high tonnages of nickel-bearing stainless steel.

A description of the pounds of nickel per ingot ton of nickel-bearing stainless is included in Chart 3.

The shortage of nickel during the Korean conflict period resulted in imposition of severe restrictions on nickel uses. In addition, the insecurity with regard to the nickel supply continues to distress the nickel stainless industry.

B. Nickel Consumed in Low Alloy Steel in the U.S.

Contrary to estimates of a continuation of the 1954 low alloy production level for the year 1955, the alloy steel business actually underwent a sizable expansion during 1955. Military demands for alloy steel increased thus serving to increase the production rate. Non-defense demand also increased in keeping with the expansion of our economy, thus arresting the previously forecast continued trend downward in low alloy steel production. The feeling on the part of the industry that the customer level of consumption during 1954 was actually higher than the indicated mill level was corroborated by the indicated expansion of demand at the mill level for low alloy steels once inventories were worked off. The lack of confidence in nickel supplies still influence the effect, the timing, and the level of product development work.

C. Nickel Consumed in non-ferrous Uses in the U. S.

During the Korean emergency there was a high demand for non-ferrous products especially for military and AEC purposes. The 1955 level is expected to be, according to reports received in the BDSA survey of nickel requirements, at a level comparable to the highest peacetime years. The expected decline of defense requirements in 1955 for non-ferrous applications did not materialize. The 1955 levels were, on the contrary, much higher than had been estimated. Non-defense uses in selected instances did not maintain their previous positions due to the limitation of nickel supply which continued in effect for those products wherein nickel proved to be a necessary ingredient. An important factor in connection with the non-ferrous industries is the fact that the increase in the defense program which appeared during 1955 was more heavily concentrated in the steel area as compared with the non-ferrous areas. This fact had a tendency to increase the total nickel consumption in steel mills and to depress total nickel consumption in non-ferrous industries. Further, the impact of government restrictions during Korea was felt very heavily by certain non-ferrous industries. These industries were hard hit by these restrictions and have as yet not been able to regain their markets. This is described in Chart 5.

D. Nickel Consumed in High Temperature and Electrical Resistance Alloys in the U. S.

Nickel consumption in high temperature and electrical resistance alloys in the U. S. is described in Chart 6.

This increase in requirements for nickel in this area reflects the growth of the electrical industries in the U. S. The growth of electric power output in the U. S. and the corresponding growth in electrical equipment and appliance installation will demand an increased availability of high temperature and electrical resistance alloys.

The impact of short nickel supply was especially hard felt in this industry, since it is precisely in this area wherein the trend of product development shows much of the greatest promise for future nickel demand. Nickel consumption in high temperature and electrical resistance alloy did not achieve expected levels in keeping with the expansion of the economy due to lack of nickel.

E. Nickel Consumed in Electroplating in the U. S.

The consumption of nickel in electroplating is described in Chart 7.

The consumption of nickel in electroplating shows a steady and substantial increase from 1946 through 1950. During the emergency period nickel consumed in electroplating was severely reduced from an all time high in 1950 to an all time low in 1951. This, of course, is attributed to the fact that during the control period virtually all electroplating except that essential to the defense program was curtailed. As the defense program began to taper off, nickel available for electroplating was markedly increased to the point where in 1954 nickel consumption in electroplating for all uses, defense and non-defense, was 30,000,000 pounds. Since this 1954 figure will include some defense business, the level of nickel consumption during 1954 for non-defense uses is still far below the 1950 consumption. The nickel plating suppliers have requested a quantity of nickel which, when added to the Government's estimate of military requirements, amounts to about 62,000,000 pounds of nickel. This compares with 36,000,000 pounds for 1950.

The anticipated increases in 1955 and 1956 are attributed directly to estimates of nickel suppliers as to the amount of nickel which they require to satisfy their customers.

Chart 8 shows the relationship between consumption of nickel in electroplating and carbon steel shipments in the U. S. from 1946 through 1955 in pounds of nickel per ton consumed in electroplating. This increased from .38 lbs per ton to .54 lbs per ton. This reflected the increased use of nickel plated products throughout industry as well as the greater thickness in the plating coat. During the emergency period severe government restrictions on electroplating influenced a reduction in the pounds of nickel per ton of carbon steel production. This trend was reversed until in 1954 approximately .50 lbs of nickel per ton of carbon steel shipments was consumed in electroplating.

The limited supply of nickel available for electroplating during 1955 resulted in a drop from .50 lbs of nickel per ton of carbon steel shipments to .42 lbs per ton. This reflects the peak record of carbon steel shipments during 1955 and demonstrates the extent to which the limited supply of nickel severely restricted the electroplaters' ability to do business. A continuation of the 1954 ratio of lbs per ton into 1955 would have made it possible for the electroplating industry to consume over 40 million pounds of nickel based upon carbon steel shipments.

As indicated above, industry plus government estimate a requirement total of 62,000,000 pounds of nickel.

The plating industry is generally faced with depletion of nickel supplies in electroplating tanks. Over the past several years these supplies have been kept at a bare minimum and tanks have never really been fully restocked to the extent required by good plating practice as defined by the plating industry. These tanks are in dire need of replacement according to industry reports.

The plating industry has expressed great concern over the impact of short supplies on the design of products away from nickel including auto parts, hardware and cooking utensils. The industry pointed to the fact that while the economy in general is permitted to expand the nickel plating industry is not expanding. This, it is claimed, is affecting employment and both formation and longevity of small business since a large part of the plating industry is small business.

Electroplaters have been forced to augment the supplies of market price nickel by the purchase of premium price nickel anodes at prices reported to be in some cases over $3.00 per pound. Government reports indicate that approximately 2 to 3 million pounds of premium price nickel entered into the country from French, Japanese and West German sources. These nickel supplies originated generally from New Caledonia ores and they are marketed in the United States at the prices indicated above whenever it is justified by demand. The dependence of certain industries upon nickel plating for the sale of its product forces these industries to pay extremely high prices in the face of nickel shortage.

Other consuming groups similarly pay high prices for supplies required to augment their normal supplies and in addition pay comparable prices for nickel contained in or derived from scrap or secondary metals.

F. Total Nickel Consumption in the U. S.

Total nickel consumption in the U. S. ranges from 160,000,000 pounds in 1946 down to about 136,600,000 pounds in 1949. During the Korean wartime emergency nickel consumption exceeded 211,000,000 pounds for all uses both defense and non-defense. The acceleration of the stockpiling program in 1954 forced a reduction in total nickel consumption to a level estimated at approximately 189,000,000 pounds while the drop in defense requirements permitted maintenance of non-defense nickel consumption at approximately 10 per cent to 15 per cent above the 1953 level. Nevertheless, total nickel consumption during 1954 was substantially less than that reported for the previous year, 1953.

In 1955 nickel consumption is expected to reach a level of 216 million pounds. This is approximately 27 million pounds higher than the 1954 rate. The 1955 consumption will be the highest level in history with the exception of World War II. Nickel consuming industries are still operating however at levels attained 5 or 6 years ago in terms of total nickel consumed while the national economy has expanded appreciably during this period. In terms of the Gross National Product we have moved from a level of 259 billions in 1948 to a level of about 390 billions in 1955.

G. Nickel Stocks in Consumers Plants

Nickel stocks in consumers plants in 1948 were at a level of 21 million pounds. This level dropped rapidly during the emergency period to as low as a million pounds.

By the end of 1954 nickel stocks were estimated at about 21 million pounds and by the end of 1955 they will be below 15 million pounds. Further adjustment in inventories below 15 million pounds although possible is not considered feasible at this time. The experience of many companies in reducing inventories below a practicable working minimum is such that it is not likely to be repeated. A reduction in inventory to the point where plant operations are dependent on daily delivery of nickel supplies by truck proved to be highly uneconomical and unsatisfactory. Delivery schedules of finished products were disrupted and orders seriously delayed causing a deterioration of customer relationships. Industry in general is refusing acceptance of orders rather than force a further drop in inventories.

This position is described in Chart 11.

H. Total Free World Nickel Supply and U. S. Share 1948–1955

There has been an upward trend of both the Free World and U. S. share of new nickel supplies from a low of 225 million pounds for the Free World and 194 million pounds for the U. S. in 1949 to a high of 428 million pounds for the Free World and 300 million pounds expected for U. S. for 1955. This represents an increase of one-half in the supply of nickel available to the U. S.

The nickel supply situation is described in Chart 11.

The nickel supply situation in relation to the consumption pattern as described in the preceding sections indicates that surpluses in mining and refining facilities and material supplies are likely to occur abruptly when the stockpile is completed. The Government's commitment to buy nickel under these conditions will be difficult to terminate as has been the case in other materials. A gradual build up of industrial markets for nickel as described above appears therefore to be in the public interest.

The expansion of Nicaro Nickel Works in Cuba, a Government operation is proceeding. It is now expected that by October 1956 the expanded portion of the plant will be in operation. By 1957, it is expected that U. S. will begin to get an additional 20 million pounds of nickel from this source. Preparations are underway for the conversion of this product into metal so as to increase its versatility in industrial use.

The Sheritt Gordon operation in Canada is also operating at levels higher than had been anticipated. Earlier estimates forecast a production of 17 million pounds as compared with actual return of approximately 20 million pounds for 1955.

Falconbridge Nickel Mines, Ltd. has announced an expansion program designed to raise nickel production to 55 million pounds per year with a goal of 45 million pounds more for 1956. This compares with an output of approximately 40 million pounds during 1955.

The Freeport Sulphur Company is now ready to begin its pilot plant operation. We are informed that this producer is prepared to go into production on a commercial basis beginning in 1958. The level of production operations is planned at approximately 30 million pounds per year.

The International Nickel Company has announced extensive exploration and underground drilling operations at its Moak Lake properties in Manitoba. The purpose of this operation is designed to determine the commercial practicability of extending nickel mining operations in this area.

The operations of all of these nickel producers indicate an intensive continuing search for new sources of nickel on a world wide basis.

NICKEL DISTRIBUTION

Delivery of nickel required for *defense* purposes is assured under the operations of the Defense Materials System administered by the Department of Commerce. Under provision of this system nickel suppliers are required to honor defense orders properly rated and certified. In this way defense requirements are met in full on a priority basis. As indicated above, defense requirements for the year 1955 rather than dropping off exceed the 1954 actual defense consumption by a substantial amount and exceeded the Government's estimate of defense requirements for the year 1955.

The impact of the defense program on the nickel supply taken together with the Government stockpiling program has created a shortage in the market. Supplies of nickel for *non-defense* uses, however, during 1955 will exceed availability during 1954 by a small percentage. This has resulted from the action on the part of the Government to divert nickel from delivery to the national stockpile in favor of delivery to industry. Such actions have accounted for an additional supply during 1955 of 24 million pounds of nickel.

These diversions have been consumed largely by the increase in defense demands over the original estimate of defense requirements for the year 1955.

A record of the Government's action is contained in the Stockpile Report to the Congress as of January–June 1955.

"As declining defense needs in 1953 somewhat eased the deficit in civilian requirements, important segments of the nickel consuming industry with the support of the Department of Commerce urged elimination of all controls over nickel even though they recognized that the supply was still inadequate. They held that continuance of Government controls would not result in a distribution more effective, more equitable or more orderly than could be accomplished in an open market and that many hardships would be eased by this action. Careful consideration was given to this proposal by all defense agencies and it was finally agreed that termination of controls could be permitted after provision was made for priority filling of defense orders, for the establishment of a firm and substantial schedule of shipments to the stockpile derived for the most part from Government-sponsored projects, and for undertakings by major producers to distribute their supplies to industry equitably. When these arrangements were made, the Office of Defense Mobilization authorized the lifting of controls on November 1, 1953.

"In 1954 the deficit in supply for civilian users was not serious. Also, stockpile acquisitions increased substantially as a result of the new expansion. However, in 1955 increasing defense requirements combined with expanded economic activity intensified supply difficulties for many users. In February 1955 the Department of Commerce urged making available to industry certain amounts of nickel scheduled for delivery to the Government in order to relieve the shortage situation. After consultation with the agencies concerned and upon the advice of the Defense Mobilization Board, seven million pounds were so released during the first six months of 1955. This quantity served to maintain civilian availabilities at about the 1954 level while delaying completion of the stockpile objective for only a short period of time. It was agreed that our improved security position resulting from expanded production and from large acquisitions for the stockpile over the intervening period could permit this action.

"By June 1955 it became apparent that the earlier tight civiliar. supply conditions were continuing. Therefore, on recommendation of the Department of Commerce and after consultation with the Defense Mobilization Board, 6.25 million pounds were released for the third quarter of 1955. However, the rate of shipments to the stockpile deriving monthly from the Government's expansion program remains substantial. Meanwhile, in the near future additional new supplies will be forthcoming from Government-sponsored projects already under contract, which will ease our security position for this metal."

During 1955 industry representatives have raised a series of questions in correspondence and conferences with both the Executive Departments and Congress concerning the distribution of nickel in the civilian market. Some of the questions raised and the answers thereto are as follows:

QUESTION: What happens to nickel originally acquired by defense ratings on which such orders are cancelled?

ANSWER: Under existing Government regulations, whenever a military order is cancelled, the customer is required to apply such unused nickel for other rated orders or dispose of it as ordered by BDSA under BDSA Reg. 2, enclosed. This is watched very closely by the BDSA and we do redirect such nickel in every case. We urge that where a nickel consumer has evidence nickel is being used or offered for sale contrary to these regulations that details be forwarded immediately to BDSA so that action can be taken to stop such sales.

QUESTION: What is the origin of continuing offers of nickel which appear in the trade at prices above normal market price?

ANSWER: It has been our experience that such nickel derives principally from European and Japanese sources. For the period January through July, approximately 2 million pounds of such nickel had been imported into the United States, as reported through our Customers procedures. There has been considerable speculation as to whether nickel acquired at market price finds its way into the premium price market. We encourage those to whom offers have been made to report to the BDSA the details of such offers in order that we can investigate and determine the origin of the material offered. In those cases where it can be determined that the material originated in the normal market as market price nickel, we inform the suppliers so that they may take steps to shut off supplies of nickel to those who are offering this material for sale rather than consuming it in their own operations. This includes those cases wherein a company may go out of business and without notifying his supplier continues to acquire nickel. In these cases the supplier is notified. Our experience indicates that suppliers acting on their own initiative can readily determine that a company has gone out of business and cut off shipments to that company very quickly.

QUESTION: What steps are taken by the Government to assure equitable distribution of nickel?

ANSWER: BDSA personnel conduct a monthly audit of nickel distributed by nickel producers in order to make sure that nickel consumers do not get more than their fair share of nickel. This is done by BDSA personnel matching up the order boards of nickel producers in order to insure that consumers do not place duplicate orders with different suppliers. In addition, the order boards of the nickel plating suppliers are audited periodically. The most recent audit was conducted during September of this year. In this way any inequities can be corrected very quickly.

In addition to the above, a careful inspection is made of orders placed on nickel suppliers under the Defense Materials System covering defense requirements. The records of each company requesting nickel for defense requirements are carefully gone over on a monthly basis. In the case of electroplaters who request nickel for defense orders of a certain magnitude, the plating supplier is required to submit a list of such orders placed indicating the name and address of the customer. A periodic check is made on a representative number of these customers requesting them to submit to BDSA a list of their order numbers, defense contract numbers, nickel required, and ratings applied. In any case which appears to be in violation of the regulations, all of the information is turned over to our Compliance Officers for further checking and appropriate action, including presentation of pertinent facts to the Department of Justice for prosecution. Similarly, on a periodic basis, the steel mills and non-ferrous mills are required to submit their entire defense order board to the BDSA for a check on defense requirements. This is done for the purpose of following our defense requirements very carefully on a continuing basis as well as for compliance purposes. Actual spot checks of invoices at the mill level are also made.

Chart 1[2] and the accompanying table describes nickel consumed by major groups as a per cent of total nickel consumption. This table shows the record of nickel consumption by industry groups from 1946 through 1955. The table and charts show the effect of restrictions on end use during Korea during which period non-functional uses were prohibited. It also demonstrates the effect of the defense load on nickel distribution since these percentages include defense as well as non-defense production. Thus during 1955, for example, the defense load was particularly heavy in the steel mills as compared with the non-ferrous and plating industries. It also indicates the extent to which the electroplating industries are consuming additional nickel with the removal of end use restrictions.

It has long been the Government's policy to taper off its purchases for Government account for stockpiling as it reaches successful completion of a stockpile goal. This is done so that the Government may withdraw from the market gradually rather than abruptly. The Government does not consider it to be good policy to continue its procurement full blast until the last ounce of stockpile has been acquired, and then abruptly leave the market to absorb the shock of Government withdrawal all at once.

Nickel supplies available to industry during 1956 will continue to fall far short of demand. The actual supply which will be available is dependent upon the Government's decision in the matter of diversions to industry and the resulting effect of these diversions upon the rate of acquisition for the national stockpile. In making these decisions the Government will, of course, take into account all of the pertinent factors both as related to industrial needs and as related to our national security.

	NICKEL CONSUMED IN STAINLESS STEEL (Million Pounds)	CHROME NICKEL (Ingot Tons)	CHROME NICKEL STAINLESS (Shipments—Net Tons)
1946	35.9	408,661	220,000
1947	30.7	356,603	202,000
1948	32.4	473,069	223,000
1949	23.8	285,461	168,000
1950	41.8	492,832	270,000
1951	43.5	411,629	243,000
1952	54.6	460,312	263,000
1953	44.5	430,798	264,000
1954	40.8	468,689	270,000
1955	52.9[2]	600,000+	360,000
1956	100.0[3]	1,000,000+	600,000

[2] Estimated [3] Projected

[1] 1946–1954 Bureau of Mines Reported Consumption.
1955 Estimated Consumption. 1956 Requested by Industry.

Chart 1

NICKEL CONSUMED IN STAINLESS STEEL IN THE U.S.-1946-1956, AND CHROME NICKEL STEEL SHIPMENTS[1]

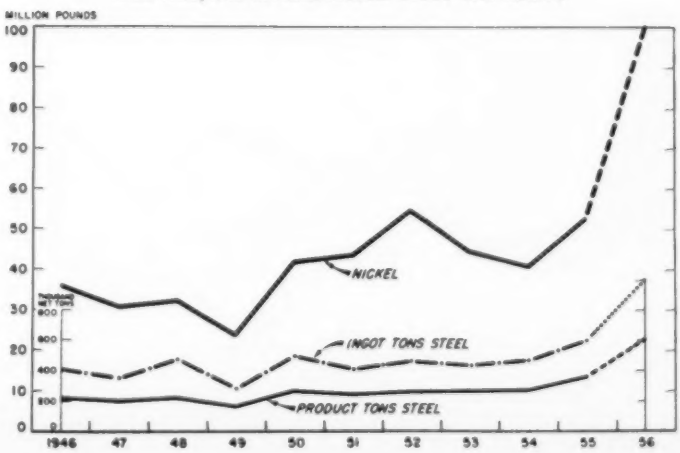
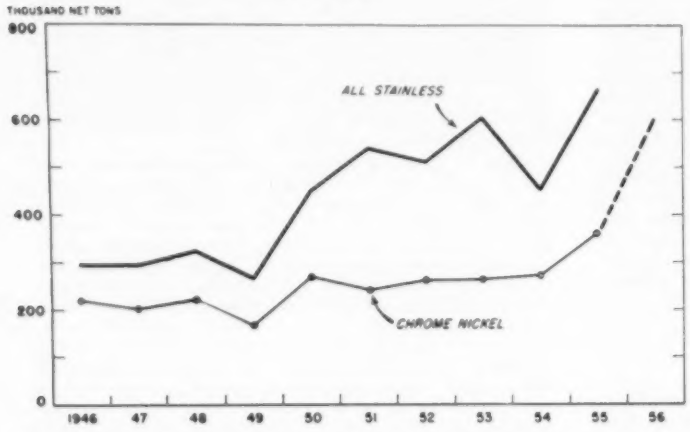


Chart 2

SHIPMENTS OF STAINLESS STEEL PRODUCTS IN THE U.S. 1946–1956[1]

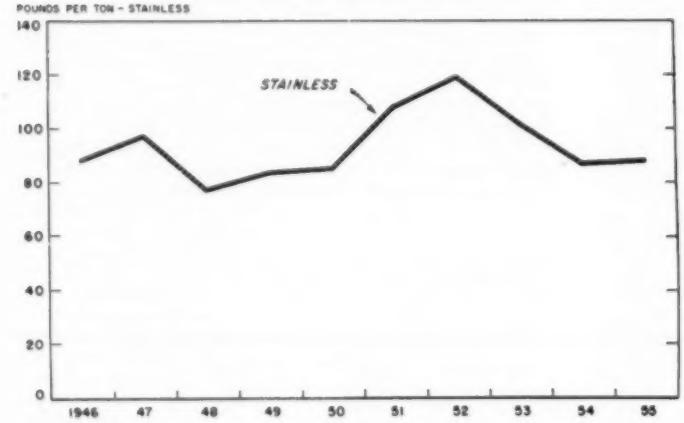


	ALL STAINLESS (Shipments)	CHROME NICKEL STAINLESS (Shipments)
1946	295,737	220,000
1947	295,546	202,000
1948	324,966	223,000
1949	267,677	168,000
1950	449,380	270,000
1951	539,510	243,000
1952	509,703	263,000
1953	601,708	264,000
1954	452,351	270,000
1955	660,000	360,000
1956		600,000

[1] 1946–1954 as Reported by AISI. 1955 Estimated. 1956 Estimated on Basis of Nickel Requested.

Chart 3

NICKEL CONSUMED PER INGOT TON OF STAINLESS STEEL IN THE U.S., 1946–1955[1]

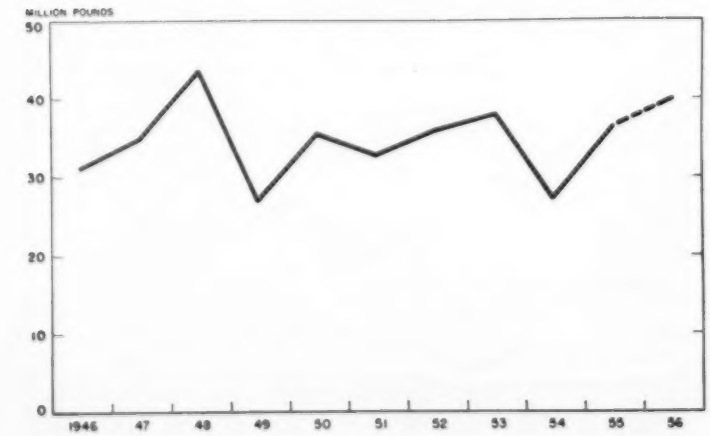


	NICKEL CONSUMED PER TON OF INGOT STAINLESS
1946	88
1947	97
1948	77
1949	83
1950	85
1951	108
1952	119
1953	102
1954	87
1955	88

[1] Based on AISI Reports of Ingot Production and Bureau of Mines Reports of Nickel Consumption.

Chart 4

NICKEL CONSUMED IN LOW ALLOY STEEL IN THE U.S. 1946-1956[1]



	NICKEL CONSUMED (Million Pounds)
1946	31.2
1947	34.8
1948	43.6
1949	26.9
1950	35.6
1951	32.9
1952	36.0
1953	37.9
1954	27.3
1955	36.3
1956	40.0

[1] 1946–1954 Bureau of Mines Reported Consumption. 1955 Estimated Consumption. 1956 Requested by Industry.

Chart 5

NICKEL CONSUMED IN NON-FERROUS USES IN THE U. S.
1946-1956[1]

NICKEL CONSUMED (Million Pounds)	
1946	51.8
1947	54.7
1948	56.1
1949	37.9
1950	56.3
1951	52.7
1952	64.0
1953	61.6
1954	56.1
1955	50.8
1956	68.0

[1] 1946-1954 Bureau of Mines Reported Consumption.
1955 Estimated Consumption. 1956 Requested by Industry.

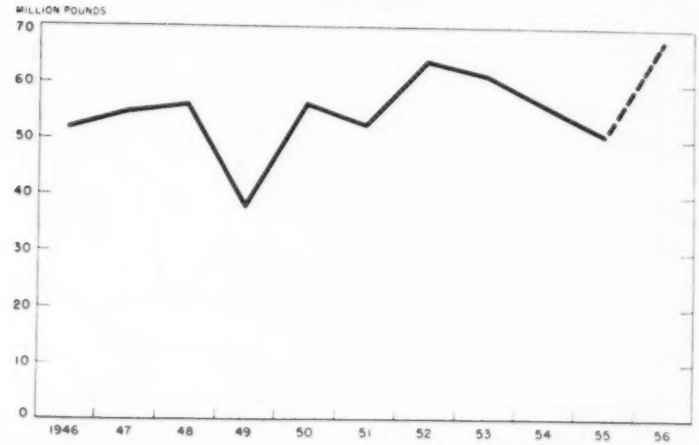


Chart 6

NICKEL CONSUMED IN HIGH TEMPERATURE AND ELECTRICAL RESISTANCE ALLOYS IN THE U. S.
1946-1956[1]

NICKEL CONSUMED (Million Pounds)	
1946	13.6
1947	10.2
1948	12.3
1949	18.1
1950	11.4
1951	14.8
1952	16.0
1953	16.4
1954	13.2
1955	16.5
1956	18.0

[1] 1946-1954 Bureau of Mines Reported Consumption.
1955 Estimated Consumption. 1956 Requested by Industry.

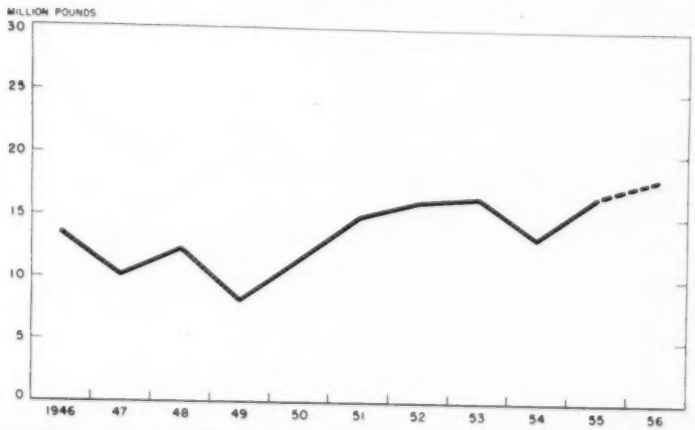


Chart 7

NICKEL CONSUMED IN ELECTROPLATING IN THE U. S.
1946-1956[1]

NICKEL CONSUMPTION (Million Pounds)	
1946	17.6
1947	19.2
1948	29.8
1949	29.1
1950	36.3
1951	12.5
1952	13.2
1953	28.5
1954	29.6
1955	32.6
1956	62.0

[1] 1946-1954 Bureau of Mines Reported Consumption.
1955 Estimated Consumption. 1956 Requested by Industry.

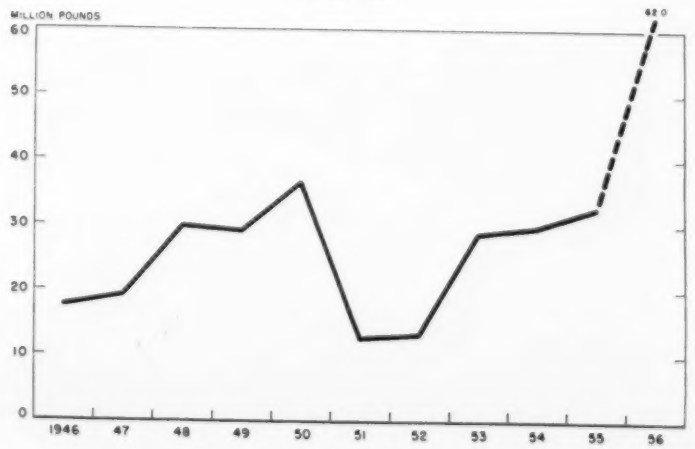
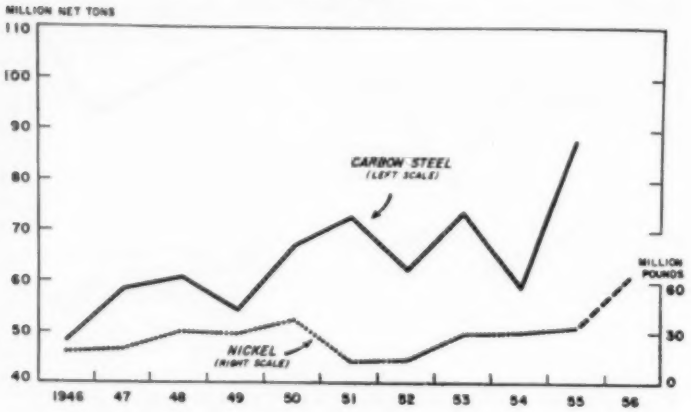


Chart 8

CARBON STEEL SHIPMENTS AND NICKEL CONSUMED IN ELECTROPLATING IN THE U.S. 1946–1956[1]

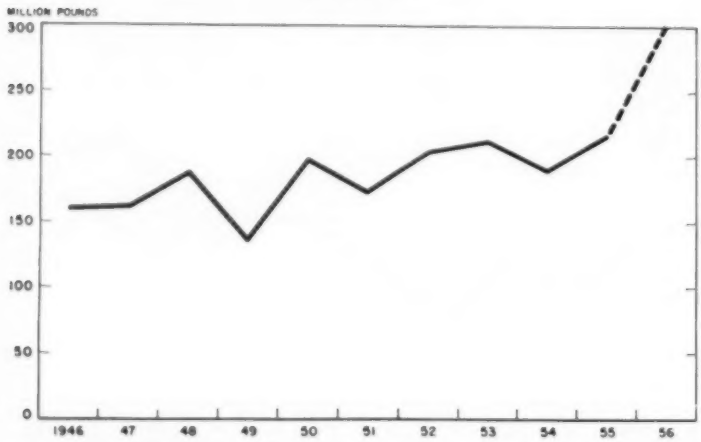


	CARBON STEEL SHIPMENTS Million Net Tons	NICKEL CONSUMED IN ELECTROPLATING Million Pounds	Pounds Per Ton
1946	48.1	17.6	.38
1947	58.5	19.2	.31
1948	60.9	29.8	.49
1949	54.3	29.1	.53
1950	67.0	36.3	.54
1951	72.6	12.5	.18
1952	62.3	13.2	.22
1953	73.7	28.5	.39
1954	58.9	29.6	.50
1955	78.0	32.6	.42
1956		62.0	.79

[1] 1946–1954 as Reported by AISI.
1955 Estimated, 1956 Requested by Industry.

Chart 9

TOTAL NICKEL CONSUMPTION IN THE U.S. 1946–1956[1]

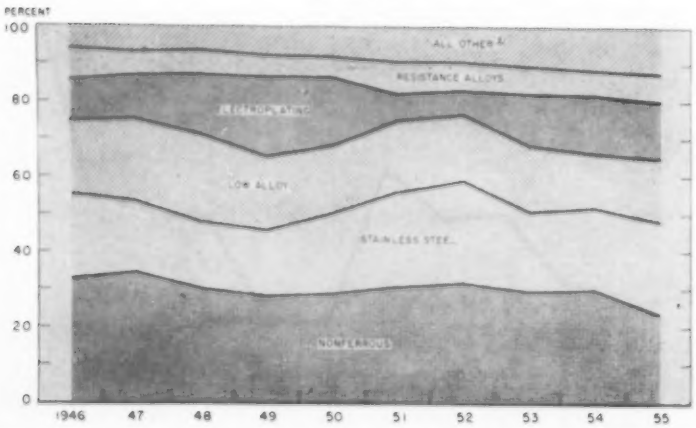


	NICKEL CONSUMPTION (Million Pounds)
1946	160.2
1947	161.5
1948	187.1
1949	136.6
1950	197.8
1951	172.8
1952	202.7
1953	211.3
1954	189.5
1955	216.0
1956	300.0

[1] 1946–1954 Bureau of Mines Reported Consumption.
1955 Estimated Consumption. 1956 Requested by Industry.

Chart 10

NICKEL CONSUMED BY MAJOR GROUPS AS A PERCENT OF TOTAL 1946–1955[1]



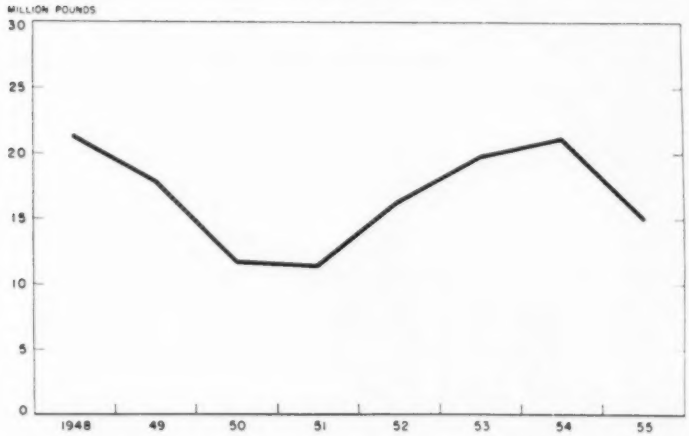
[1] 1946–1954 Bureau of Mines Reported Consumption.
1955 Estimated Consumption.
[2] Includes Ferrous Cast Irons, Catalysts, Ceramics, Magnets, and all Other Uses.

NICKEL STOCK (Million Pounds)	
1948	27.3
1949	17.9
1950	11.8
1951	11.4
1952	16.3
1953	19.8
1954	21.2
1955	15.0

[1] 1948–1954 Bureau of Mines Year-End Reports.
1955 Estimated.

Chart 11

NICKEL STOCKS IN CONSUMERS PLANTS
1948–1955[1]

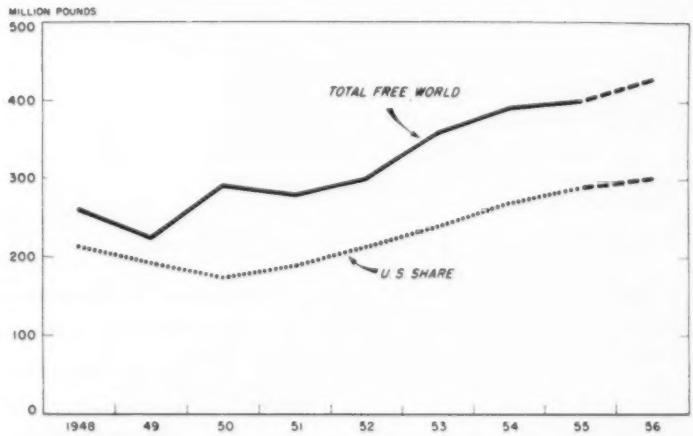


	FREE WORLD	U.S. SHARE	% OF TOTAL
1948	260	213	81.9
1949	225	194	86.2
1950	291	174	59.8
1951	280	188	67.1
1952	300	213	70.7
1953	358	238	66.5
1954	391	269	68.8
1955	400	290	72.5
1956	428	300	70.1

[1] 1948–1952 International Materials Conference Reports.
1953–1956 Bureau of Mines Reports.

Chart 12

TOTAL FREE WORLD NICKEL SUPPLY AND U.S. SHARE
1948–1956[1]



NICKEL CONSUMPTION (Million Pounds)	ALUMINUM CONSUMPTION (Million Pounds)
1946 160.2	1054
1947 161.5	1281
1948 187.1	1526
1949 136.6	1173
1950 197.8	1782
1951 172.8	1800
1952 202.7	2040
1953 211.3	2426
1954 189.5	2339
1955 216.2	3289
1956 180.0	3600
1957 180.0	4000

[1] 1955–1957 Estimated.

Chart 13

COMPARISON OF PRIMARY NICKEL AND ALUMINUM CONSUMPTION
1946–1957[1]

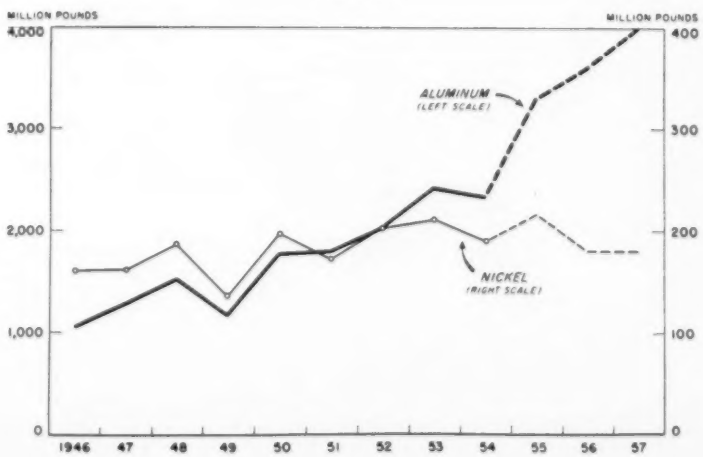


Chart 14

Nickel Consumed by Major Groups as a Per Cent of Total 1946-1955[1]

	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955
Nonferrous	32.4	34.1	30.0	27.8	28.5	30.5	31.6	29.1	29.6	23.4
Stainless Steels	22.5	19.0	17.4	17.4	21.1	25.2	27.0	21.1	21.6	24.5
Low Alloy	19.5	21.5	23.3	19.7	18.0	19.0	17.7	17.9	14.4	16.8
Electroplating	11.0	11.9	15.9	21.3	18.4	7.3	6.5	13.5	15.6	15.1
High Temp. & El. Re. All.	8.5	6.4	6.6	5.9	5.8	8.6	7.9	7.8	7.0	7.6
All other[2]	6.1	7.1	6.8	7.9	8.2	9.4	9.3	10.6	11.8	12.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1]1946-1954 Bureau of Mines reported consumption.
1955 Estimated Consumption.
[2]Includes ferrous cast irons, catalysts, ceramics, magnets, and all other uses.

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"NICKEL STORY"

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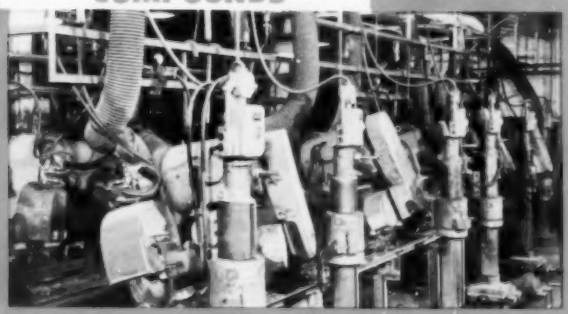

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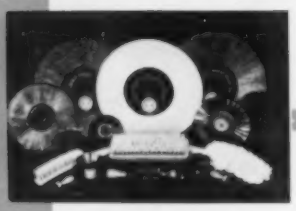
ve, ask for the literature described in this bulletin.



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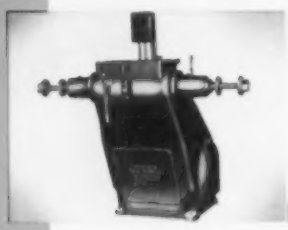

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PATENT ABSTRACTS

No. 2,714,088, July 26, 1955—Electrodeposited Coatings—W. Karash, assignor to Harshaw Chemical Co., Cleveland, Ohio.

The deposition of bright, adherent chromium over antimony is claimed by interposing a very thin nickel film over the antimony—by electrodeposition, for example. Metals other than nickel include cobalt, zinc, iron, white brass and copper. One of the claims includes the above schedule over antimony which itself was plated over lead tin or silver.

15 claims.

—AES—

No. 2,715,059, August 9, 1955—Phosphating Composition—D. Miller, assignor to Kelete Products, Inc., Los Angeles, Calif.

Claimed is a process for producing a dry orthophosphate compound as discrete particles by agitating anhydrous sodium acid pyrophosphate (I) with 85 per cent phosphoric acid (II) in the proportion of 1 part of I to 2 parts by weight of II. The operation is carried out at about 140° F.

1 claim.

—AES—

No. 2,714,560, August 2, 1955—Method of Decorating a Surface with a Crackle Finish—R. Hookway, assignor to Sherwin Williams Co., Cleveland, Ohio.

The steps in the process includes coating the surface first with an oleoresinous composition which remains tacky for some time, then recoating with a latex water emulsion paint as a continuous wet film of non-uniform thickness.

11 claims, figure.

—AES—

No. 2,714,575, August 2, 1955—Production of Metallic Titanium—E. Wainer and M. Sibert, assignors to Horizons Titanium Corp., Princeton, New Jersey.

The method claimed is the electrolysis of an alkali metal fluotitanate in an anhydrous fused salt bath containing along with the alkali fluotitanate at least one halide selected from the alkali metal or alkaline earth halides as well as about 0.2 per cent of a tetravalent metal halide (based on fluotitanate), such as zirconium, hafnium or thorium, to increase the particle size of the electrodeposited titanium.

9 claims.

—AES—

No. 2,714,277, August 2, 1955—Deburring or Polishing Machine—W. Moore, W. Lafayette, Indiana.

A machine for operating on the interior of a hollow article of annular cross-section having a head tool expandable by centrifugal force is described.

9 claims, figure.

—AES—

No. 2,715,093, August 9, 1955—Electrolytic Production of Molybdenum and Coherent Deposits—S. Senderoff and A. Brenner, assignors to U.S.A.

Electrolysis of a fused halide bath containing 15–40 per cent of potassium hexachloromolybdate and 85–60 per cent of an alkali halide electrolyte. The electrolysis is carried out in an inert gas atmosphere.

11 claims.

No. 2,715,094, August 9, 1955—Hermetically Sealed Transformers—G. Szekely, assignor to Crest Laboratories, New York and S. K. Transformer Co., Bloomsburg, N. J.

This method of hermetically sealing an electrical apparatus includes coating with insulation, then with an electro-conductive layer to seal seams.

4 claims.

—AES—

No. 2,715,095, August 9, 1955—Method and Apparatus for Electrolytic Treatment of Slide Fasteners—C. Cohn, Atlantic City, N. J.

An apparatus for electrolytically treating zippers mounted on tape is described.

6 claims, figure.

—AES—

No. 2,715,096, August 9, 1955—Antimony Plating—Don Burnside, assignor to Radio Corporation of America.

Claim 3 states "a process for electroplating antimony which comprises electrodepositing antimony from an aqueous solution comprising:

Antimony Trichloride	200–400 g/l
Sulfuric acid	130–190 ml/l
Hydrofluoric acid (2%)	490–600 ml/l

Claim 5 gives the temperature as under 50° C and the current density is 10–25 asf.

5 claims.

—AES—

No. 2,715,151, August 9, 1955—Electric Storage Battery—C. Gritman, et. al., assignors to Electro-Acid Corporation, Glendale, California.

To the conventional 1.275 sulfuric acid electrolyte is added about 0.05–0.15 per cent of a selenium compound as selenic or selenous acid.

3 claims—See also Nos. 2,715,148, 2,715,149, and 2,715,150.

—AES—

No. 2,715,589, August 16, 1955—Metallic Impregnation of Porous Metal—B. Smith, assignor to Ferro Powdered Metals, Inc., Ohio.

The porous metal is impregnated with a metal alloyable therewith and of lower melting point by briquetting the impregnant metal with a non-metallic inert material, the briquette and porous metal then being heated face-to-face to permit the low melting metal to migrate as a liquid into the porous metal. Finally the inert material is removed.

1 claim.

—AES—

No. 2,715,652, August 16, 1955—Electric Battery Equipment—M. Chubb and J. Dines, assignors to Eagle Picher Co., Cincinnati, Ohio.

This battery, designed to operate over a wide temperature range, consists of two cells in series. One cell consists of a pasted cuprous chloride positive electrode and a pasted zinc negative electrode. The second cell has a pasted cuprous chloride positive electrode and a magnesium negative electrode. The cells are positioned so that the heat produced by discharge of the magnesium cell is absorbed by the zinc cell.

2 claims, figure.

—AES—

No. 2,715,653, August 16, 1955—Primary Cell—R. Reid, assignor to Dow Chemical Co., Midland, Michigan.

This cell has a magnesium anode, a cathode of carbon with manganese dioxide as a depolarizer and an aqueous electrolyte containing an alkali metal, alkaline earth metal or ammonium bromide. The improvement is the inclusion of 0.1 to 1.5 per cent of a particulated metal below and including magnesium (Al, Bi, Co, Cu, Fe, Pb, Mn, Ni, Sn, Zn) of 50–325 mesh size in the mixture.

6 claims.

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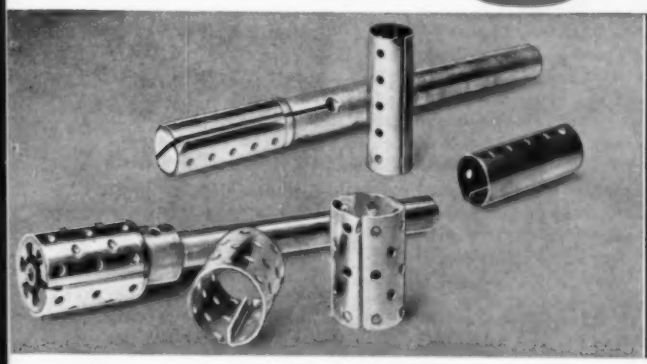

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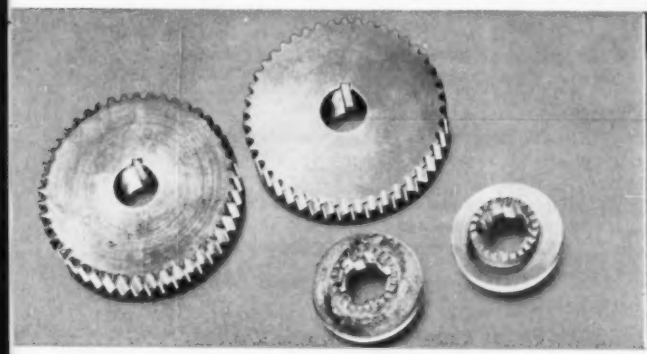

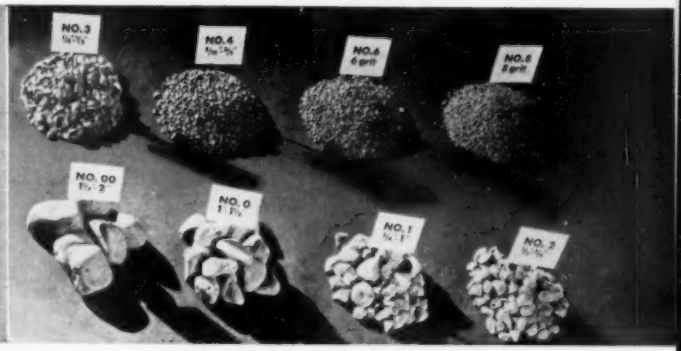

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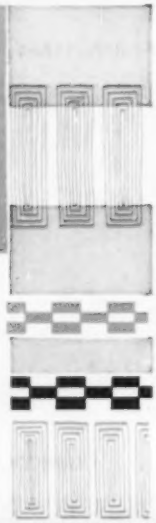

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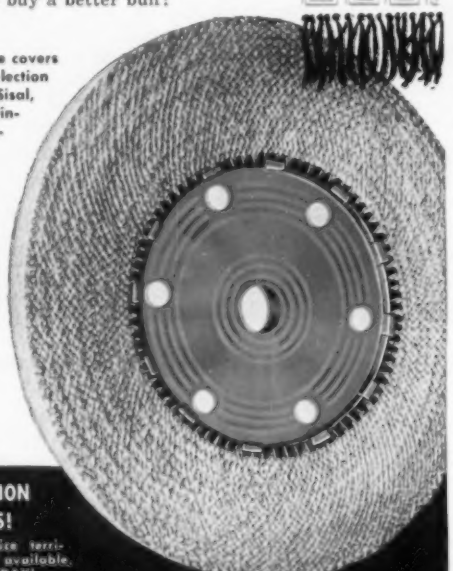

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PATENT ABSTRACTS

No. 2,715,083, August 9, 1955—Method of Applying Sulfide Coatings on Stainless Steel—J. Baxter, assignor to Parker Rust Proof Co., Detroit, Michigan.

The method involves the introduction of the stainless steel into an aqueous solution, pH about 6.5 to 3.3, containing 0.001 per cent to saturation of fluoride ion and 0.03 per cent to saturation of a sulfur compound capable of providing sulfide ions at surface of the stainless steel (sulfite mentioned). Figures relating minimum bath temperature and per cent of fluoride ion, minimum per cent fluoride and pH, and temperature and pH are given.

8 claims, 3 figures.

—AES—

No. 2,716,415, August 30, 1955—Plating Machine—J. Davis and C. Clark, assignors to The Udylite Corporation, Detroit, Michigan.

A plating conveyor so designed that the track sections may be aligned with each other in a position to engage and support a carrier when the frame is in the upper position and means for selectively moving pairs of track sections when the frame is in a lower position. Basically this is a selective plating conveyor.

13 claims, figure.

—AES—

No. 2,716,596, August 30, 1955—Determination of Tin on Tinplate—D. Robertson, assignor to National Steel Corp., Weirton, W. Va.

The sample is arranged as an anode in a bath of hydrochloric acid and the tin deplated as an inert gas is bubbled through the solution. The stannous chloride is then titrated with iodine.

8 claims, figure.

—AES—

No. 2,716,989, September 6, 1955—Apparatus for Treating Metal Parts—C. Joy, assignor to Holcraft & Co., Detroit, Michigan.

The apparatus consists of a processing tank, an elevator movable in and out of bath, a drum supported on the elevator rotatable perpendicular to rate of travel of elevator and movable by the elevator. Successive drums are included, registering one with another, and means provided to transfer articles from one drum to another.

12 claims, figure.

—AES—

No. 2,716,802, September 6, 1955—Method of Making Heat Exchanger Devices—Carl Greer, assignor to Tanter Mfg. Inc., Michigan.

A method for forming a heat exchanger from flat stock and having integral fins is claimed.

2 claims, figure.

—AES—

No. 2,717,218, September 6, 1955—Chemical Nickel Plating Methods and Apparatus—P. Talmey and W. Crehan, assignors to General American Transportation Corp., Chicago, Illinois.

The Kanigen method of electroless nickel plating is described. See AES PROCEEDINGS for 1954, p. 256, et. seq. for a general picture covered by this patent of 39 claims and 3 figures.

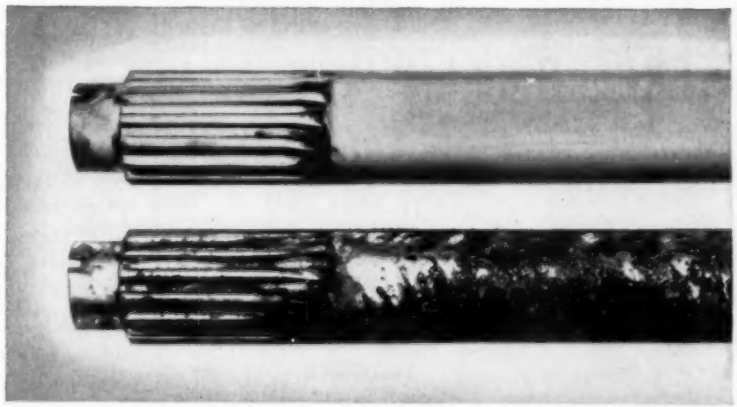
—AES—

No. 2,717,840, September 13, 1955—Method of Forming a Coating of Metal on Glass—C. Bosch, assignor to Fox, Wells & Co., New York, N. Y.

The method consists of degreasing the glass with solvent, treating with an alkali silicate solution then placing on the glass a molten metal of the class of indium and indium alloys, having the property of wetting glass.

2 claims.

New Crack-Free Chromium Plate gives superior protection



Upper steel shaft, with 0.0005 inch of Crack-Free Chromium, was virtually unaffected after 100-hour salt spray test. Surface of lower shaft with 0.0005 inch of ordinary chromium was completely covered with rust.

Structurally perfect chromium finish

Differences in the structure of ordinary chromium and Crack-Free Chromium deposits are shown by the photomicrographs below.

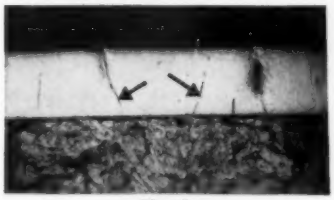


Fig. 1

Fig. 2

Figure 1 shows a cross section of etched ordinary chromium .00125" thick, with part of its network of cracks. Note that some cracks extend through the deposit to the base metal, providing an unimpeded path for corrosives.

Figure 2 shows a section of etched Crack-Free Chromium also .00125" thick. Note the complete absence of cracks.

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A basic need has at last been satisfied. A chromium deposit which gives better protection against corrosion is now obtainable by means of a new process developed by United Chromium.

Unichrome Crack-Free Chromium Plating produces more ductile deposits which are free from cracks. Deposits do not crack even when they are built up to hard plating thicknesses. In this respect they are unlike ordinary chromium which develops cracks, providing corrosives with paths to the underlying metal.

EFFECTIVE PROTECTION DIRECTLY ON STEEL

The photograph above shows that .0005" of Crack-Free Chromium plated directly on the steel prevented rusting of shafts subjected to 100 hours of salt spray, while the same thickness of ordinary chromium failed completely.

In other corrosion tests, parts plated with .0003" of Crack-Free Chromium were as good as new after a full year at 100% relative humidity and 110°F whereas parts with ordinary chromium were entirely covered with rust in days.

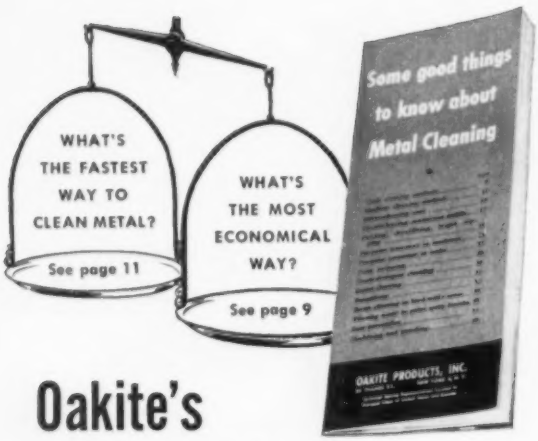
For many decorative applications, Unichrome Crack-Free Chromium can be plated directly on steel or zinc base die castings, eliminating need for scarce nickel.

OTHER BENEFICIAL PROPERTIES

Crack-Free Chromium deposits are hard (500 to 700 Knoop), have a low coefficient of friction, and a non-galling, non-seizing surface. The plate has superior ductility and resistance to thermal shock. Unusual leveling action is provided by the solution.

Its grayish, matte finish needs buffing for high luster, but this is done as readily as buffing dull nickel. Attractive two-tone effects can be produced by buffing some areas, leaving others as plated.

Unichrome Crack-Free Chromium has already proved its advantages for hard chromium plating and certain decorative applications in successful commercial operations. Bulletin CFC-1 gives more details. Send for your copy.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PATENT ABSTRACTS

No. 2,717,234, September 6, 1955—Method of Preparing K_2UF_6 for Fused Bath Electrolysis—R. Nagy and J. Marden, assignors to U. S. Atomic Energy Commission.

One object of the invention was to produce a uranium salt that can be electrolyzed to produce uranium metal of high purity. The method consists of heating uranous oxide with potassium acid fluoride at elevated (800° C) temperatures to yield K_2UF_6.

11 claims.

—AES—

No. 2,717,843, September 13, 1955—Sheet for Protection of Metals from Corrosion—A. Wachter and N. Stillman, assignors to Shell Development Co., Emeryville, Calif.

This patent concerns corrosion inhibition, particularly articles wrapped in paper or similar material under moist conditions. The process consists of binding (with a colloidally despensible adhesiveness) a secondary amine phosphate (e.g. dicyclohexylamine phosphate) and an alkali metal nitrite ($NaNO_2$) to the paper. By ionic interchange the amine nitrite is formed which in the presence of moisture and at the controlled pH releases the volatile amine nitrite which inhibits corrosion.

17 claims.

—AES—

No. 2,717,844, September 13, 1955—Method of Rendering Titanium Dioxide Films Electrically Conductive—L. Koller, assignor to General Electric Co., Schenectady, N. Y.

A supported film of titanium dioxide is covered with a layer of finely divided zinc and baked at 550°-600° C. in a non-oxidizing gas atmosphere.

9 claims.

—AES—

No. 2,717,870, September 13, 1955—Electrodeposition of Manganese—R. Dean, Washington, D. C.

The deposition of a smooth bright plate of manganese is claimed from a solution with the composition:

10–50 g/l	Mn^{++}
6–17 mols/l	NH_3
pH 9–10.5	

Current density is given as 100–1000 asf and the temperature below 45° C. The simple anion associated with the manganous ion may be sulfamate or alkane sulfonate in which case bright deposits are obtained at current densities well below those required for bright plating if sulfate is the anion.

4 claims.

—AES—

No. 2,717,845, September 13, 1955—Metal Descaling Method—Roy Carter, Warren, Ohio.

An elongated metal piece is moved and successive portions of said piece are subjected to heating with hot gases, and immersed in a molten sodium hydroxide-sodium hydride bath then a second heating is followed by a water spray.

4 claims, figure.

—AES—

No. 2,718,494, September 20, 1955—Metallic Coating for Wire—C. Faust, assignor to U.S.A.

This invention relates to substitute coating for tin on copper wire by plating the wire with a lead-antimony alloy (88:12 per cent) in an aqueous solution of 7.5 f/l of basic lead acetate, 18 g/l of sodium hydroxide, 3.5 g/l of sodium hydroxide tartrate, 19 g/l potassium antimonyl tartrate and 12 g/l of potassium tartrate.

2 claims.

No. 2,721,154, October 18, 1955—Production of Conducting Layers upon Electrical Insulating Materials—P. Hopf and R. Lishmund, assignors to Ward Blenkinsop & Co., London, England.

A slurry of a finely divided electrical conductor in a volatile inert solvent is placed on the smooth face of a synthetic (insulating) organic plastic, a part of the volatile solvent is evaporated then heat and pressure is applied to the slurry-coated surface to cause the conductor particles to cohere and become imbedded in the plastic. See also 2,721,152 and 2,721,153 by same inventors.

7 claims.

—AES—

No. 2,721,149, October 18, 1955—Art of Tin Plating—J. Nelson, assignor to Sinclair Refining Co., New York, N. Y.

An oil for use immediately following the hot dip tinning of steel is described as consisting of high molecular weight microcrystalline wax acids, produced by substantially complete oxidation of microcrystalline wax containing 34 to 55 carbon atoms per molecule, and by a saponification number of less than about 200.

1 claim.

—AES—

No. 2,721,119, October 18, 1955—Stripping Tin from Copper—F. Bauch, assignor to General Motors Corp., Detroit, Michigan.

The process of stripping tin from copper or copper base alloys includes first removing any organic material covering the tin, after which the tin coated copper bearing metal is immersed in a dilute sulfuric acid solution containing copper ions in the amount of 28 to 56 g/l for sufficient time to strip off the tin. The metal is finally given a nitric-sulfuric acid bright dip.

3 claims.

—AES—

No. 2,720,487, October 11, 1955—Galvanic Plating of Hardened Copper—M. Meth, Atlantic City, N. J.

A transparent plate is racked and silvered in the usual fashion, rinsed and while still wet, a spray of 6 to 40 oz/gal of copper sulfate and ½ to 2 oz/gal of phosphoric acid is applied to the silvered surface and simultaneously there is applied a mixture composed of 1 to 6 oz/gal of finely divided metal dust (Zn, Fe, Cd, Ni, Co, Cr) which is homogeneously suspended in water.

6 claims.

—AES—

No. 2,720,472, October 11, 1955—Method of Pickling Iron and Recording Pickling Agent—C. Miller, assignor to Cleveland Industrial Research, Inc., Cleveland, Ohio.

The method consists of pickling with sodium or potassium bisulfate; the recovery includes raising the pH to at least 7.0 with ammonia, removing the insoluble iron and finally heating the alkali ammonium sulfate to regenerate the bisulfate.

11 claims, figure.

—AES—

No. 2,719,821, October 4, 1955—Gold Alloy Plating Bath—Charles Campana, New York, N. Y.

An acid-resistant, tarnish-proof gold alloy is claimed may be plated from a bath containing:

Gold cyanide	0.5–1.5 oz/gal
Palladium chloride	0.166–0.5 oz/gal
Copper cyanide	0.5–1.5 oz/gal
Nickel cyanide	0.5–1.5 oz/gal
Cadmium cyanide	0.05–0.16 oz/gal
Potassium cyanide	2.0–6.0 oz/gal
Sodium Chloride	0.5–1.5 oz/gal
Potassium hydroxide	1.0–3.0 oz/gal

Claim 2 says bath consists of an aqueous gold and palladium solution containing at least one of the three other heavy metals (Cu, Ni, Cd) mentioned in claim 1.

2 claims.

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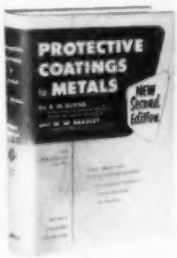

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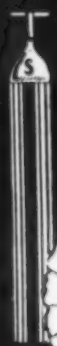

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PATENT ABSTRACTS

No. 2,719,820, October 4, 1955—Method for Coating Steel Strip—W. Allen, assignor to U. S. Steel Corporation.

The method includes electrodeposition of a prime coating (0.1–0.2 lb/bb), spraying a heavier coating of the metal (tin, terne, lead zinc) in a sealed enclosure having a non-oxidizing atmosphere, heating the strip to melt the prime coating and to alloy the coatings with the strip.

4 claims, figure.

—AES—

No. 2,719,797, October 4, 1955—Platinizing Tantalum—E. Rosenblatt and J. Cohn, assignors to Baker & Co., Inc., Newark, N. J.

Claim 5 describes a method of producing an anode for use in electrochemical processes by providing an adherent coating of platinum on tantalum. This is done by cleaning and roughtening the tantalum, depositing a thin platinum coat thereon (claim 8 covers use of chloroplatinic acid in volatile solvent to deposit thin coat), bonding by heating in an inert atmosphere at 800°–1400° C. An electrodeposit of platinum is then laid down, the part heated to 800°–1400° C. and finally reduced by rolling or drawing.

13 claims.

—AES—

No. 2,719,796, October 4, 1955—Process for Enameling Aluminum—VandenBerg, et.al., assignors to Aluminum Co. of America, Pittsburgh, Pa.

The first step is to prepare the aluminum by treating with an aqueous acid solution containing 2–4 per cent by weight of chromic acid and between 10-25 per cent sulfuric acid at a temperature of between 70–100° C for 1–5 minutes. Then an enamel melting below 580° C is applied and fired.

4 claims.

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200 lbs Ammonium Sulphate
1275 lbs Magnus 55P
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350 lbs Metaclean
400 lbs Dyclene E. S.
750 lbs Clean Cut Honite
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No. 2,719,781, October 4, 1955—Method for Treating Aluminum—F. Hesch, assignor to Kaiser Aluminum & Chemical Corp., Oakland, Calif.

Aluminum is given a bright finish by immersing the article in an aqueous acid solution maintained at 180° F to boiling and containing fluoride ions and nitric acid within limits as shown in a diagram printed in the patent. Copper ions should also be present in the amount of at least 0.001 g/l. See also 2,719,079 issued to J. Murphy, assigned to Kaiser, and covering fluoride ions.

19 claims, figure.

—AES—

No. 2,719,095, September 27, 1955—Production of Corrosion Resistant Coating on Copper Infiltrated Skeleton Bodies—J. Scanlon, assignor to American Electro Metal Corp., Yonkers, N. Y.

The process for increasing the corrosion resistance of copper infiltrated iron powdered metal parts consists of (1) selectively removing copper from the exposed area of the object (powder metal compact copper infiltrated) to a depth of 0.0005 to 0.001 inch and (2) depositing chromium in the pores opened up by the removal of the copper.

2 claims, figure.

—AES—

No. 2,719,094, September 27, 1955—Coating Device—P. Clough, assignor to National Research Corporation, Cambridge, Mass.

A process is described for manufacturing a wick element, readily wetted by molten aluminum and used as a support for aluminum during vacuum evaporation of aluminum for coating, which consists of a dense carbon element coated with molybdenum or tungsten deposited by the reduction of carbonyls of said metals.

6 claims, figure.

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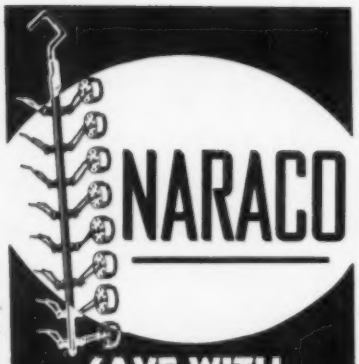

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ARTICLE REFERENCES

By
WILLIAM TUCKER
Eastman Kodak
Rochester, N. Y.

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a. *SURFACE TREATMENT AND FINISHING OF LIGHT METALS. PART VII—INDUSTRIAL ANODIZING OF ALUMINUM AND ITS ALLOYS*
S. Wernick and R. Pinner
Metal Finishing, Vol. 53, No. 11, November 1955, p. 74–77.

2. ANODIZING

a. *FACTORS AFFECTING THE FORMATION OF ANODIC OXIDE COATINGS IN SULFURIC ACID ELECTROLYTES*
Ralph B. Mason
Journal of the Electrochemical Society, Vol. 102, No. 12, December 1955, p. 671–675

3. CHROMIUM

a. *NEW CHROME FINISH CUTS PART HANDLING AND CLEANING*
T. P. McFarlane
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4. CORROSION

a. *CONTROL OF COUPLES DEVELOPED IN WATER SYSTEMS*
G. B. Hatch
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b. *PROPER RINSING PRACTICE CURBS PINPOINT CORROSION*
L. J. Brown, Samuel Spring and W. J. Hennessey
The Iron Age, Vol. 176, No. 22, December 1, 1955, p. 110–114

c. *THE EFFECT OF ALLOYING ELEMENTS IN IRON ON HYDROGEN OVER-VOLTAGE AND CORROSION RATE IN ACID ENVIRONMENTS*
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a. *COATING ON POLISHED STRIP SAVES REFINISHING COSTS.*
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6. NICKEL

a. *PROPERTIES AND USES OF HEAVY NICKEL DEPOSITS*
J. W. Oswald
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a. *A SURVEY OF NOVELTY FINISHES*
Harry Burrell
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b. *NEW COATINGS PROTECT ALUMINUM TRUCK BODIES*
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8. POLISHING

a. *SATIN FINISHES: IMPORTANT IN POLISHING AND GRINDING STAINLESS*
Walter A. Kerr
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10. PRECIOUS METAL

a. *PRECIOUS METAL PLATING: USES EXPAND IN INDUSTRY*
P. J. Sloane and Isidore Cross
Iron Age, Vol. 176, No. 20, November 17, 1955, p. 120–123

11. STRUCTURE

a. *THE STRUCTURE OF ELECTRODEPOSITED METALS*
Rolf Weil and Harold J. Read
Metal Finishing, Vol. 53, No. 11, November 1955, p. 60–65

12. TIN

a. *SOME PROPERTIES OF TIN (II) SULFATE SOLUTIONS AND THEIR ROLE IN ELECTRODEPOSITION OF TIN. III. SOLUTIONS WITH TIN (II) SULFATE, SULFURIC ACID AND ADDITION AGENTS*
C. A. Discher
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13. TITANIUM

a. *ELECTRODEPOSITION OF TITANIUM ON BASE METALS*
M. E. Sibert and M. A. Steinberg
Journal of the Electrochemical Society, Vol. 102, No. 11, November 1955, p. 641–647

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Dr. C. Fred Gurnham
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14. WASTE DISPOSAL

a. *INSTRUMENTATION IN THE DISPOSAL OF FINISHING WASTES*
A. Linford
Electroplating and Metal Finishing, Vol. 8, No. 11, November 1955, p. 384–388

Below are listed the addresses of publishers where the reader may send for article references.

Corrosion
M & M Building
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85 Udney Park Rd.
Teddington, England

Grinding & Finishing
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Wheaton, Illinois

Iron Age
56th and Chestnut Sts.
Philadelphia, Pa.

Journal of the Electrochemical Society
216 W. 102nd Street
New York, N. Y.

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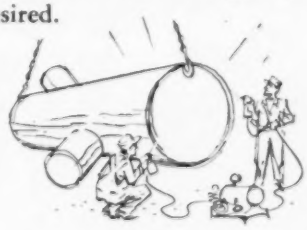

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BOOKS

Theoretical Structural Metallurgy by A. H. Cottrell. Second Edition. St. Martins Press Inc., New York, 1955, pp. 251, $4.50 nonmembers, $4.00 members. Reviewed by Dr. Richard McQuaid.

The author in the Preface to the First Edition of this book states that a need for an account of the theoretical advances in physics, written for metallurgical students by a metallurgist, prompted the preparation of the book. The second edition represents a complete rewriting of the first edition omitting a discussion of some of the classical concepts. The reviewer is not familiar with the first edition, but the second edition admirably satisfies the intended aim of the author. He has adhered to the plan of presenting theoretical matter with almost no mention of experimental technique. The book is intended as a reference for metallurgy students at undergraduate or graduate level, and in the opinion of the reviewer this purpose is well served.

The end results of the latest theories of solid state physics and statistical thermodynamics as applied to the metallic state are presented in a lucid manner without recourse to the complicated mathematical operations by which they were derived. The text of the book has been well arranged. The illustrations are in nearly every case on the same page as the portion of the text to which they refer.

The first six chapters of the book are devoted to an account of the most recent theories of quantum mechanics as applied to the metallic state. The author develops the theories of atomic structure and interatomic forces in the first two chapters. He devotes chapter III to metallic crystals, presenting modern crystallographic theories as they have been applied to the metallic state. Unfortunately a complete job has not yet been done in the field, so that the author has had to do the best he could with our somewhat limited knowledge. Chapters IV, V and VI discuss the electron theory of metals. The reviewer's sole objection to these chapters is that the author has presented the zone theory without indicating that there are some theoretical objections. Chapter VI is devoted to applications of the electron theory in the fields of electrical conductivity, ferromagnetism and cohesion or the metallic bond. The sections on conductivity and ferromagnetism make up half of the chapter. The latter does not include some of the latest structural information which possibly had not been published at the time of the writing of the book. Cohesion and the metal bond are discussed in two sections, the second section being a presentation of Pauling's theory. It appears obvious that the author does not agree with Pauling's theory, but he has done a good job of presenting some of its favorable points in a concise manner.

The remaining chapters of the book are concerned with the thermodynamics of metals and alloys and the kinetics of phase changes in the metallic state. The discussion of the physical meaning of entropy in chapter VII is good. Chapter IX on the structure of alloys covers the subject well, but since the author does not discuss the details of experimental techniques, the reader has no idea how such information is obtained. The same criticism applies to chapter XV on shear processes.

The chapters on phase equilibrium and phase changes give a fairly typical coverage of the subject. The derivation of the phase rule used in this book is one of the clearest and best written to be found in any book.

This book in the opinion of the reviewer is one of the best written books for its purpose. It is recommended very highly for serious students of metallurgy.

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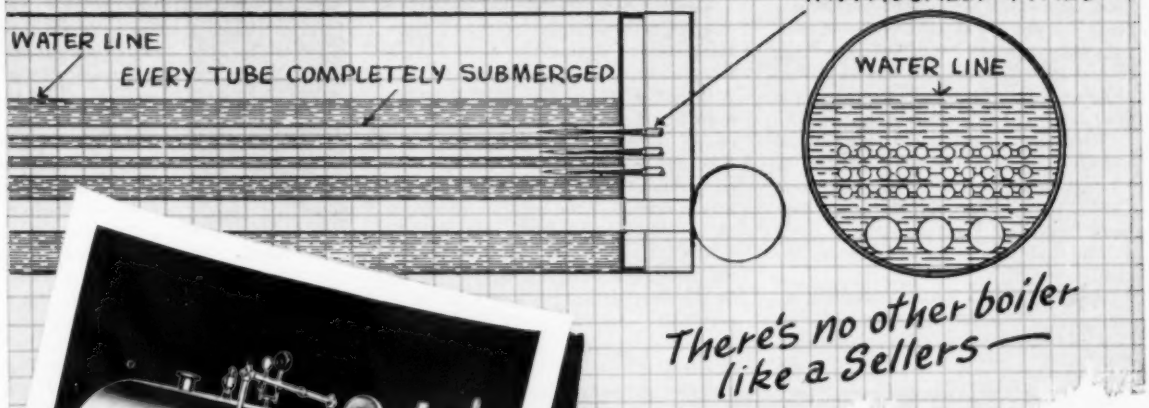

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Recommendations for the second annual ASTE Honor Awards should be sent to the National Honor Awards Committee at ASTE Headquarters, 10700 Puritan Avenue, Detroit 38, Michigan.

The four awards to be made by the Society are:

ASTE Progress Award—honoring accomplishment in the field of manufacturing techniques or production methods. (ASTE members or non-members eligible).

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ASTM B-8 SYMPOSIUM

Feb. 29, 1956—Buffalo, N.Y.

Committee B-8 of the American Society for Testing Materials announces a Symposium on Wednesday, February 29 at the Hotel Statler, Buffalo, N. Y. The Symposium will be of especial interest to executives, engineers and others involved in the production, testing and use of plated coatings. Eight papers will be presented at a morning and afternoon session and will cover a variety of subjects including a summation of performance data obtained from testing various combinations of copper-nickel-chromium; also lead, cadmium and zinc coatings and chemical conversion coatings of the latter metals. Also included will be considerations of such matters as metal cleaning procedures, evaluation of the salt spray test method and work related to certain physical properties of plated coatings.

Pinner

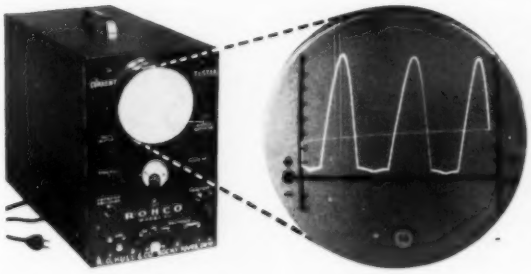
Membership in ASTM is not required for admission. The Society is extending an invitation for attendance by all who are interested, with no registration fee involved.

Chairman of the symposium is Walter L. Pinner of Houdaille-Hershey Corp., Detroit, Michigan, and National Past President of the American Electroplaters' Society. Pinner is also chairman of committee ASTM B-8, Sub H on Performance Tests.

The program:

Morning Session: 9:30 A.M.

1. Introductory Remarks by the Chairman.
2. "History of ASTM Committee B-8," William Blum, Retired (formerly Director of Chemistry Section, National Bureau of Standards).
3. "Corrosion Behavior and Protective Value of Decorative Copper-Nickel-Chromium and Nickel-Chromium Coatings on Steel," C. H. Sample, International Nickel Company.
4. "Evaluation of Methods Available for Measurement of Surface Luster in Plated Coatings," Glade Bowman, Standard Steel Spring Division, Rockwell Spring and Axle Company.
5. "Metal Cleaning Prior to Electroplating," S. Spring, Pennsalt Manufacturing Company.



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The MODEL C3 CURRENTESTER is a new-type oscilloscope with easy-to-read 3 inch screen. As simple to operate as the latest television sets. Connects to busbars to give a quick diagnosis of such defects as electrical leakage or poor connections within rectifier; one or more phases overloaded; one or more phases out; weak or inefficient stacks; open circuits; excessive ripple; and many others.

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Trouble with your plating? Don't always blame the plating solution. Look to your rectifiers for one or more hidden ailments that may decrease electrical efficiency, slow down production, or give poor quality of plating. The Rohco® Currentester affords the ONLY SURE way of detecting and correcting rectifier defects. The improved Model C3 Currentester at the new low price of $150.00 is the cheapest insurance you can buy for tip-top rectifier performance. ORDER YOURS TODAY.

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- **ON ALUMINUM** Iridite gives you a choice of natural aluminum, a golden yellow or dye colored finishes. No special racks. No high temperatures. No long immersion. Process in bulk.
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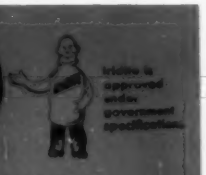

INTERSOCIETY NEWS

Adjournment for Luncheon

Afternoon Session: 2:00 P.M.

6. "Comparison of the Corrosion Behavior and Protective Value of Electro-deposited Zinc and Cadmium Coatings on Steel," C. H. Sample and R. B. Teel, International Nickel Company; and A. Mendizza, Bell Telephone Laboratories.
7. "Evaluation of Supplementary Conversion Coatings on Zinc and Cadmium," R. E. Harr, Western Electric Company.
8. "Atmospheric Exposure of Electroplated Lead Coatings on Steel," A. H. DuRose, Harshaw Chemical Company.
9. "The Standard Salt Spray Test—Is It a Valid Acceptance Test," A. Mendizza, Bell Telephone Laboratories.

New Directory Planned by EJC

The Engineering Societies Directory, a complete list of all engineering societies in the United States, together with pertinent information about them, will be published by Engineers Joint Council tentatively as of June 1, 1956.

The Directory will be a new publication, not a revision of the Engineering Societies Yearbook, which was published in 1948, and which has been discontinued.

Questionnaires will be mailed to all known societies about January 16 and should be returned to EJC by March 1. If a society has not received such a questionnaire by that time, it should contact Engineers Joint Council, 29 West 39th Street, New York City.

The Directory will be the only complete listing of engineering societies at all levels and will be available at $3.50 per copy.

Important Notice to Members and Subscribers

If you are going to move, it is necessary that the proper notification be made, at the earliest possible moment, so that you may continue to receive your copies of PLATING without interruption.

Such notification should be made to headquarters by letter, post card, or post-office form No. 22S, giving the old address as well as the new, with postal-zone number if any. You should also notify your local post office on postal form No. 22 of your change of address. Both postal forms are obtainable at any post office.

As considerable time is required to process a change of address, you are urged to advise the PLATING Circulation Department as soon as you know your new address, preferably three weeks in advance of moving.

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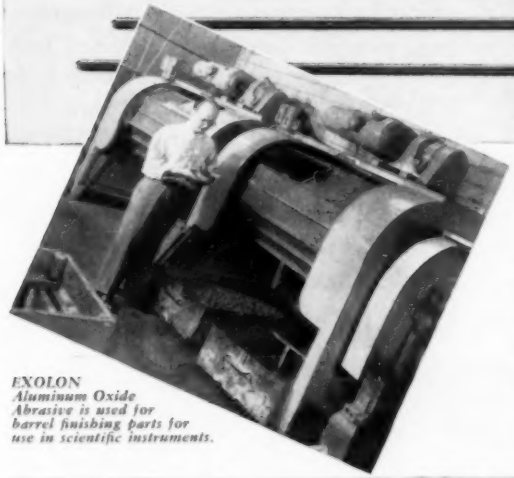

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BALTIMORE-WASHINGTON CONVENTION NOTES

About Your 1956 Host Branch

The Baltimore-Washington Branch is not one of the largest but its contributions to "The Advancement of the Science of Electroplating" have been out of proportion to its size.

In May 1928, William W. Chase of the Agate Lacquer Company and Fred F. Pierdon of Art Metal Finishing Company, aided by Dr. William Blum assembled a group of interested men at the Southern Hotel in Baltimore. The Supreme Society's contribution to this organization effort consisted of sending representatives who were of considerable assistance. They were the 1st Vice-President, Horace Smith, the Secretary-Treasurer, George Gehling, and the Chairman of the Publishing Committee, George B. Hogaboom.

With such a good start, the members went right to work. The permanent charter was granted in January of 1929. By the end of the first complete fiscal year, the membership had increased to 36. The records of the Branch before 1935 are incomplete because of a fire that year in the Branch Secretary's office. Most of the information about that period is found in a brief history written by Wendell Barrows (a charter member) at the request of Kenneth M. Huston during his second term as Branch President.

An early project of the Branch promoted by Dr. Blum was a series of four training courses. These were conducted at the Bureau of Standards during the first four years of the Branch's operation.

As early as 1930 this enthusiastic group took on a job of host to the Annual Convention. This was operated on a budget of $4832.66 of which $100.00 was contributed to the Research Fund and $150.00 was contributed to the Supreme Society.

The Branch has furnished speakers for meetings of other branches and few Conventions have passed without at least one speaker from Baltimore-Washington. Two of our members are Honorary Members of the Society and two are Past Presidents. Six of our Charter Members are still on the roll of active members.

But enough history. This is the season when we make a lot of resolutions. The next month, or week, or day, we start to break them. One of them that should be easy to keep is a resolution to attend the coming Convention in Washington.

The Baltimore-Washington Branch started this year's resolutions several years ago when they decided to make this convention the best ever. One important resolution is that everyone attending should have some time for seeing Washington. To further this aim at least one of the educational sessions will be held at night, leaving that afternoon free.

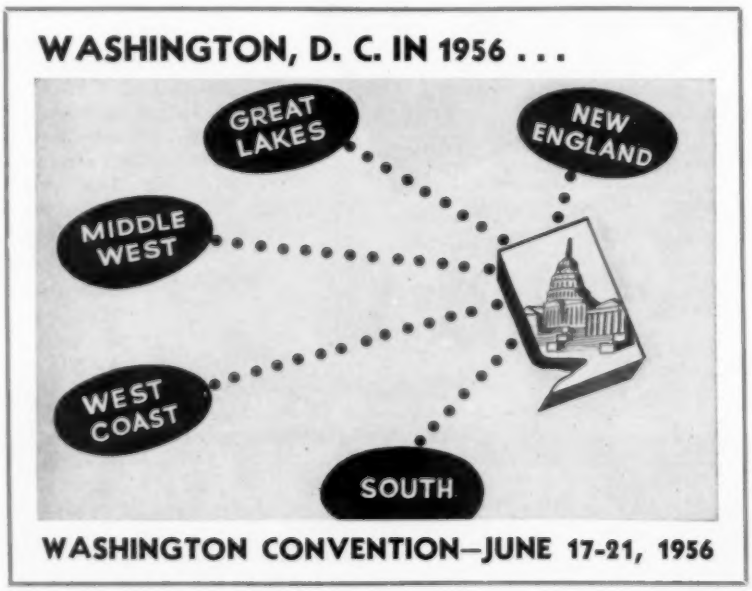
Many of the Conventioneers will have an extra day or two to spend. They will want to see things they missed or to get a better look at things for which time in the full schedule is limited. For them we have prepared a series of "Tabulated Tours" which they can follow on their own. Here is a sample.

Tabulated Tour No. 1

Place	Points of Interest	Transportation
Library of Congress	One of the largest libraries in the world. First draft of Gettysburg Address: Gutenberg Bible Misc. historical papers.	No. 40 Lincoln Park car from K & Connecticut
Folger Shakespeare Library	Collection of Shakespeareana and Elizabethan Theater	Cross the street from Library of Congress
The Capitol	Guided tours every 15-minutes 25c. To see Congress in session obtain pass from your Senetor or representative. Any Capitol guard can tell you when he is in town.	Walk 1-block
Senate Office Building		Subway from sub-basement in North wing of Capitol.
Botanical Gardens	Large Collection of rare plants and flowers.	Walk to South-west corner of Capitol grounds.
Department of Justice Building	FBI tours, 9:30 to 4:00	Walk west on Pennsylvania Ave. to 9th Street.
Archives Building	Declaration of Independence The Constitution	Walk west on Pennsylvania Ave. to 13th St.
Department of Commerce Building	Continuous statistical recording machine for births and deaths. Aquarium.	Walk west on Pennsylvania Ave. to 14th St.
Pan American Union Building	Patio with Aztec & Mayan motif; banana, coffee, rubber and papaya trees. Exhibits of South American Craftsmanship.	Walk South to Constitution Ave. West to 17th.

Return to Statler by R-4 Farragut Square bus from 18th and Constitution.

Washington D.C. in 1956
"A Capital Idea"



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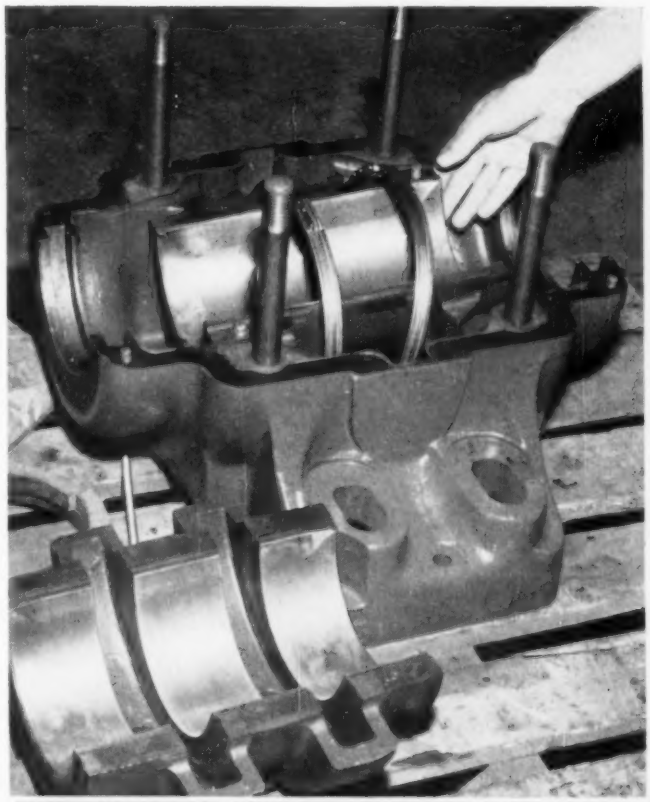

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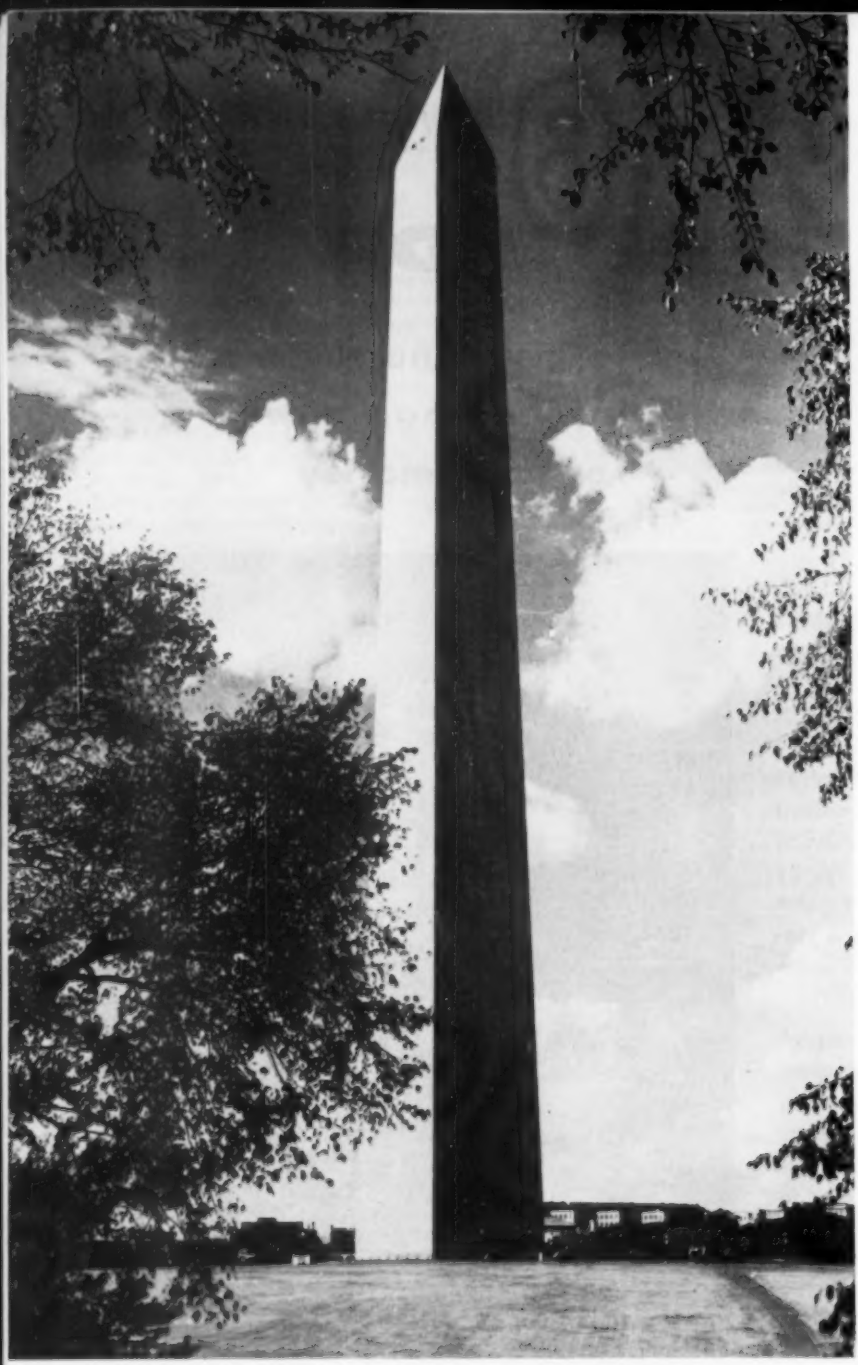


WASHINGTON BECAUSE . . .

The American Electroplaters' Society is fortunate that the Convention for 1956 is scheduled to take place in Washington. Our Capital is also the capital of the world.

Washington, your Federal City, is in your backyard—

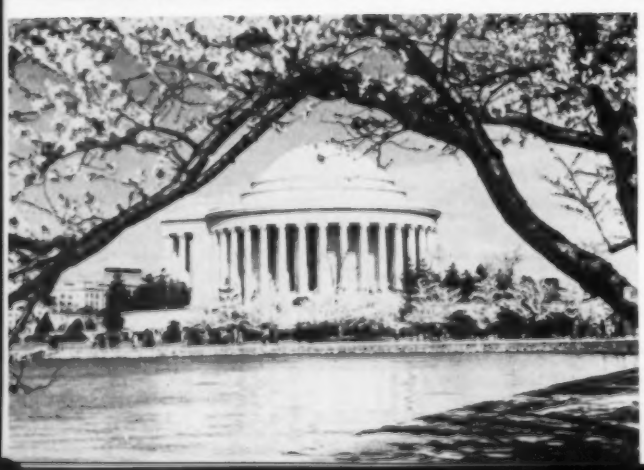
BECAUSE

Sixty per cent of our country's population is located less than four hours distant by air, and less than overnight by train. Through the finest airport in the world flows the traffic of well over four thousand airplanes a week bringing our neighbors from the West Coast and our friends from abroad to your Nation's Capital in half a day. Every day, two hundred forty-six fast passenger trains arrive and depart for this Federal City. The greatest arterial highways of the country funnel into Washington, bringing a steady flow of buses and motorists to enjoy the comfort, courtesy and hospitality which prevails.

Washington, your city, is waiting for You.

The Convention Committee is trying very hard to make time available to all the conventioneers to visit points of interest in Washington. This is as it should be for every nation looks to our Capital.

Here is a wonderful opportunity to accomplish two things at once: attend what promises to be one of the best technical conventions the AES has ever held and see the many points of interest afforded by this beautiful city:



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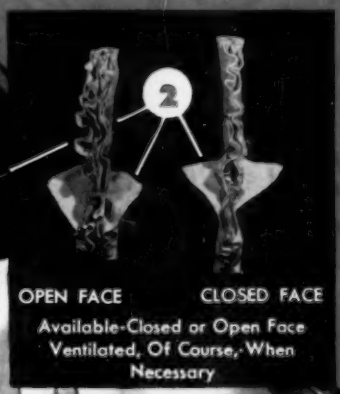

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AQUARIUM—Basement of Commerce Building, 14th Street between E and Constitution, N.W. STerling 3-9200. Open 8:30 a.m. to 5:00 p.m. daily and Sunday.

ARLINGTON NATIONAL CEMETERY—JAckson 2-3000. Grounds open daily and Sunday. November, December, January and February, 7:00 a.m. to 5 p.m.; March, 7:00 a.m. to 6:00 p.m.; April, 7:00 a.m. to 7:00 p.m.; May and June, 6:00 a.m. to 7:30 p.m.; July and August, 6:00 a.m. to 7:00 p.m.; September, 6:00 a.m. to 6:00 p.m.; October, 7:00 a.m. to 5:30 p.m. Located here are the Tomb of the Unknown Soldier, the Amphitheatre and the Lee Mansion. Change of guard at the Tomb every hour on the hour. Mansion open daily and Sunday. April through September, 9:30 a.m. to 6:00 p.m.; October through March, 9:30 a.m. to 5:00 p.m. Admission 12¢; children under 12 free; school groups, if chaperoned, admission 2¢. No charge to service personnel, of course.

ARMY MEDICAL MUSEUM—The Mall at 9th and Independence Avenue, S. W. REpublic 7-6700, Extension 3492. Open daily and Sunday, 9:00 a.m. to 5:00 p.m.

BUREAU OF ENGRAVING AND PRINTING—14th and C Streets, S. W. REpublic 7-5151. Open 8:00 a.m. to 11:00 a.m. and 12:30 p.m. to 2:00 p.m., Monday through Friday. Closed Saturday, Sunday and Holidays. Conducted tours.

CAPITOL—Capitol Hill. NAtional 8-3120. Open daily and Sunday, 9:00 a.m. to 4:30 p.m. Open after 4:30 p.m. if Congress is in session, until one-half hour after adjournment. (Tours 9:00 a.m. to 3:55 p.m.; groups form every 15 minutes. Guide service 25¢.)

CHRISTIAN SCIENCE BUILDING—16th & Eye Streets, N. W. NAtional 8-3472. Christian Science World Activities on Display. Open daily 10:00 a.m. to 6:00 p.m. Sunday and Holidays, 2:00 p.m. to 6:00 p.m. Admission free.

CORCORAN GALLERY OF ART—17th and New York Avenue, N. W. MEtropolitan 8-3211. Closed Monday. Tuesday through Friday; 10:00 a.m. to 4:30 p.m., Saturday; 9:00 a.m. to 4:30 p.m., Sunday and Holidays; 2:00 to 5:00 p.m. Closed Christmas and July 4th.

DUMBARTON OAKS—1703-32nd Street, N. W., ADams 2-3119. Museum: 2:00 p.m. to 5:00 p.m., Tuesday through Sunday. Gardens: 2:00 p.m. to 5:00 p.m., Saturday and Sunday.

FEDERAL BUREAU OF INVESTIGATION—9th and Pennsylvania, N. W. EXecutive 3-7100. Open Monday through Friday, 9:30 a.m. to 4:00 p.m. Tours start every half hour in Room 5634 and last approximately one hour. Advance reservations advisable for group tours. Closed Saturday, Sunday and all Holidays.

FORD'S THEATRE (LINCOLN MUSEUM)—10th Street between E and F, N. W. Republic 7-1820. Open Monday through Saturday 9:00 a.m. to 9:00 p.m.; Sunday and Holidays, 12:30 p.m. to 9:00 p.m. Admission 10¢. The building in which Lincoln died is directly across the street and is open to the public from 9:00 a.m. to 5:30 p.m.; Sunday and Holidays, 12:30 p.m. to 5:30 p.m. Admission 10¢.

FRANCISCAN MONASTERY—14th and Quincy Streets, N. E. LAwrence 6-6800. Conducted tours from 8:00 a.m. to 5:00 p.m. daily.

GUNSTON HALL—Open 9:30 a.m. to 5:00 p.m. daily. Admission 50¢. Easily reached by Shirley Highway, 25 miles south of Washington.

JEFFERSON MEMORIAL—South bank of the Tidal Basin. REpublic 7-1820. Open daily and Sunday, 9:00 a.m. to 9:00 p.m.

LEE MANSION—In Arlington Cemetery, open daily and Sunday, 9:30 a.m. to 4:30 p.m.

LINCOLN MEMORIAL—West Potomac Park at the Foot of 23rd Street, N. W. REpublic 7-1820. Open daily and Sunday 9:00 a.m. to 9:00 p.m.

MOUNT VERNON—Mount Vernon, Virginia. KI 9-5600. Open daily and Sunday, 9:00 a.m. to 5:00 p.m., February through October; 9:00 a.m. to 4:30 p.m., November through February. Admission 50¢, children under 12 and service personnel in uniform free.

NATIONAL ARCHIVES—7th and Pennsylvania, N. W. REpublic 7-7500. Open 9:00 a.m. to 10:00 p.m. weekdays. 1:00 p.m. to 10:00 p.m. Sunday and Holidays.

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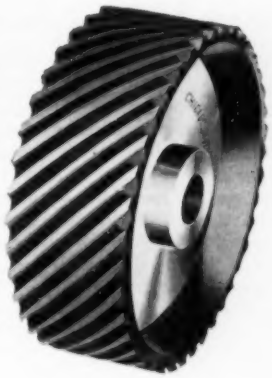

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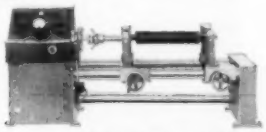

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AES NEWS

AES Research Committee Approves Project on Mechanical Finishing of Metal Surfaces

A dozen members of the AES Research Committee braved the wintry blasts of Boreas to meet at the Detroit Statler on December 2.

The meeting, under the direction of Chairman Leslie C. Borchert of Houdaille Industries, Inc., considered many items of business among which was the approval of a new project on the mechanical finishing of metal surfaces scheduled to be conducted at the Chicago Electro-Platers' Institute.

Clyde Kelly, President of the AES, accepted the district supervisorship of this project. The rest of the project committee includes C. E. Kennedy, chairman; Scott Modjeska, Leonard Weeg, J. H. Monaweck and J. E. Fretts.

R. Racine reported that the proposed folder on the promotion of the Sustaining Membership program was in the final editing stage and that it would be in printed form and available for distribution among branches within six weeks. It was also reported that the November Sustaining Membership count had reached an all-time high of 325 members and 364 memberships, thanks to the efforts of branch research chairmen.

E. Parker and A. DuRose were commended for their efforts in the voluminous research which they were conducting to gather a historical record of AES research accomplishments since the inception of the program. A summary of this research is being prepared by DuRose for Sustaining Membership promotion purposes.

The following were named to the Nominating Committee: L. C. Borchert, chairman; R. J. Racine and E. A. Parker.

Present at the Detroit meeting: Messrs. Borchert, Racine, DuRose, W. Meyer, R. Ehrhardt, Parker, C. Sample, L. Gilbert, G. Best, P. Kovatis, R. Schaefer and E. Candee.

Dayton was the site chosen for the next meeting on Friday, March 9, 1956.

Toronto, Buffalo, Southeastern Lead Competition

Toronto (Canada), Buffalo, and Southeastern top AES branches in the eight month membership competition which brings the AES total to another all-time high of 7,096.

Total membership as of December 1, 1955, including Sustaining Members, is 7,096 or an increase of 163 members or a 2.4 per cent increase since April 1, 1955. An award of $50 is presented yearly at the convention to branches in divisions showing the best membership improvement during the fiscal year.

The first five leaders in each division are listed below:

BRANCH MEMBERSHIP COMPETITION

BRANCH	Members Apr. 1, 1955	New Members	Net Change Membership	Per Cent Change
First Division (126 members and over)				
1. Toronto	149	20	+20	+13.4
2. Los Angeles	278	20	+22	+ 7.9
3. Newark	274	20	+15	+ 5.5
4. Detroit	668	48	+31.5	+ 4.7
5. Milwaukee	178	18	+ 8	+ 4.5
Second Division (70-125 members)				
1. Buffalo	93	14	+14	+15.1
2. Sydney	93	10	+10	+10.8
3. Providence-Attleboro	90	10	+ 7	+ 7.8
4. Cincinnati	92	12	+ 5.5	+ 6
5. San Francisco	75	6	+ 4	+ 5.3
Third Division (10-69 members)				
1. Southeastern	52	14	+ 9	+17.3
2. Lancaster	62	12	+ 8	+12.9
3. Dallas-Ft. Worth	48	6	+ 5.5	+11.5
4. Seattle-Puget Sound	35	6	+ 4	+11.4
5. Louisville	38	4	+ 4	+10.5

Mendizza to ASTM A-5 Post for Society

Mendizza

A. Mendizza of Bell Telephone Laboratories Inc. of Murray Hill, N. J., was named AES Liaison Representative to ASTM Committee A-5 on Corrosion of Iron and Steel this month by Clyde Kelly, AES president.

For the past three years, Mendizza has been concerned chiefly with engineering of metallic finishes and with corrosion problems in general. He received his undergraduate training in chemical engineering at Cooper Union and at Columbia University he obtained his Master's degree. He is also a member of ASTM B-8.

The scope of ASTM A-5: "The collection of engineering information relating to the serviceability of both bare and metallic-coated iron and steel products when subject to corrosion, and the formulation of methods of test and specifications, and work on related subjects."

He Won the Cigar (Cough, Cough)

Havana for Detroiter. Detroit branch prexy, L. Morse, lights up extra long, expensive cigar for R. J. Racine who spearheaded recent successful drive for Sustaining Members in Detroit area. In early 1955, Racine was promised "longest cigar he ever smoked" if his drive went over top. Only "hitch" came when cigar donor learned after "presentation" that Racine was non-smoker

Meet Mr. President

Ogle French was born in Hutchinson, Kansas, March 13, 1906. Graduated from Hutchinson High School 1924 and attended the University of Wichita 1925 through 1927, thence University of Kansas 1928 through 1929. French majored in chemical engineering.

He was state chemist for the Kansas State Grain Inspection Department from 1929 through 1931. During the years 1931 through 1935 he operated an alcohol plant for the Wichita Vinegar Works. From 1935 through 1937, French was service engineer for the Chrysler Air Temp Corporation.

After leaving Chrysler, he formed his own business in the name of Thomas, Stone and French Industrial Engineers, specializing in high temperature heat exchangers between the years 1937 through 1950.

In 1950, French joined the Cessna Aircraft Company on special assignment. He took over the foremanship of processing, which includes aluminum and steel heat treating, plating, and all plating operations.

He is married, has one boy and one girl and his hobby is leathercraft.

He is a member of the Blue Lodge, 32nd Mason Shrine.

"Joe" Petrocelli is Director of Research, The Patent Button Company, Waterbury, Connecticut. Received a BA and MA degree from Wesleyan University, PhD degree from Yale University. At present is chairman and editor of the Corrosion Division of the Electrochemical Society and president of the Waterbury branch of the American Electroplaters' Society. Has been active in research work in the field of Electrochemistry particularly plating, corrosion and instrumentation and, has authored several papers on the mechanism of electrode processes. He is a member of the American Association for the Advancement of Science, The Electrochemical Society, American Chemical Society, and the American Electroplaters' Society. "Joe" is married and the father of two daughters and one son. His main hobby is fishing.

Meet the abbot

Here's a little man you'll surely want to know. Philosopher and physicist, mathematician and mechanic, designer and doodler, dreamer and detective — these are a few of the intriguing facets which make up the engaging personality of *the abbot*.

Space doesn't permit us to tell you all about him here. Suffice it to say he's a dedicated soul (he professes no specific creed or faith) who has devoted his life to a study of "Barrel Finishing — with Steel Balls and Shapes" . . . particularly our own tumbling barrels and tumbling materials.

We think you'll want to read the fascinating case histories which he will present in this space in the months ahead, but first, we'd like to send you a more detailed explanation of his background and how he came to select his favorite study subject. So, just drop us a line and we'll send you a formal introduction to . . . *the abbot*.

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AES NEWS

National Tech. Task Committee on Industrial Wastes

Report of the Electroplating Industry to Task Group III, December 1, 1955

By Dr. C. Fred Gurnham* and Dr. D. Gardner Foulke**

The electroplating industry is able to report continuing progress toward pollution abatement during 1955. The literature on plating wastes contains a markedly increased number of accounts of construction and operation of full-scale treatment plants.

Analytical Methods. The analysis of electroplating wastes is reasonably well covered in the 10th edition of "Standard Methods for the Examination of Water, Sewage, and Industrial Wastes," issued during 1955. Any dissatisfaction with this book and suggestions for improvement should be reported where they will do some good. There is, for example, in the Federation of Sewage and Industrial Wastes Associations, a Committee on Standard Methods, with subcommittees on cyanides and metals as well as on other specific analyses.

Additional journal articles on analytical methods have appeared during 1955, by Serfass (Lehigh University), Shaw (University of Texas), and others.

Treatment Methods. The treatment methods developed during recent years remain popular. There is increasing attention to waste reduction by materials salvage operations and good housekeeping in the factory. Chlorination is the most common method of destroying waste cyanides.

Applications of ion exchange are increasing, principally because this technique abates pollution by recovery of useful materials. Evaporation is being used to concentrate chromate wastes in several plants, and was reported during 1955 for the concentration and recovery of zinc cyanide liquors.

Research. The principal sponsored research on plating wastes is that of the American Electroplaters' Society. Currently, attention is being given to the kinetics of cyanide oxidation by ozone. This work is being conducted at Yale University under the direction of Professor B. F. Dodge.

Destruction of cyanide wastes by bacterial action has been investigated in England, and a summary report was presented at the 1955 Purdue Conference. Related experiments, sponsored by the National Institutes of Health, are under way at Michigan State University.

The toxic effects of plating-room wastes, in streams, in water supplies, and in sewage treatment plants, are being investigated more intensively than previously. Typical of this research are studies completed or now in progress at the Academy of Natural Sciences of Philadelphia, relating to the synergistic effects of temperature, pH, and hardness on the toxicities of copper, zinc, cyanide, and combinations of these constituents.

C. Fred Gurnham
* AES Liaison Rep.

D. Gardner Foulke
** AES Liaison Rep. Alternate

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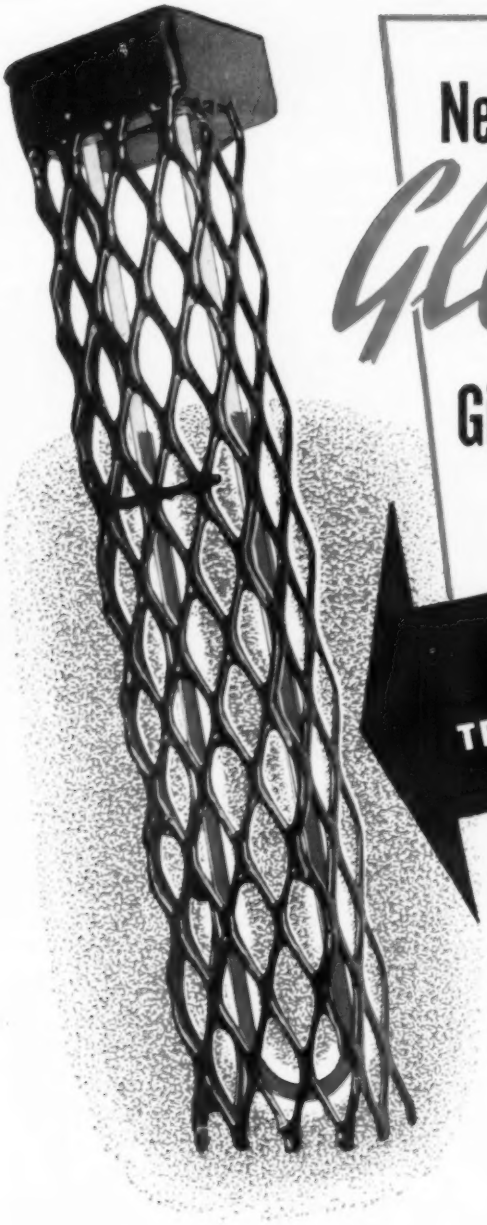

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BRANCH NEWS

BALTIMORE-WASHINGTON

Seyb and Scott Talk on Crack-Free Cr and Organic Finishes

The November meeting of the Baltimore-Washington branch was held in the Marling House in Baltimore, Maryland.

The order of business was very short.

Seyb

Lawrence M. Darrow, Anthony M. Juskelis and **Harold W. Scott** were elected to membership.

Our two speakers for the evening were both introduced by vice-president **Jules Horelick.**

The first to speak was **Dr. E. J. Seyb, Jr.,** of United Chromium, whose subject was "New Developments in Crack-Free Chromium." He discussed the plating characteristics of the process, the increased corrosion resistance, the ductility, impact resistance, ease of grinding and buffing of the deposits. His talk was well illustrated with slides.

F. L. Scott, also of United Chromium, was the second speaker. He gave a very comprehensive talk on "Organic Finishes and Protective Coatings" of interest to electroplaters. Both talks were well received.

CARL H. THIEDE, Secretary

BRIDGEPORT

Much Business; Innis Talks on Aluminum Metal Finishing

The regularly scheduled business meeting and educational session of the Bridgeport branch AES was held on Friday, November 11, 1955 in the main ballroom of the Hotel Barnum, Bridgeport, Conn., at 8:30 P.M.

New England Regional—vice-chairman **William Lindsay** reported in detail on the progress made at the recent committee meeting of the N. E. Regional. The constitution and bylaws would be changed to provide for our reentry and to assign, in proper sequence, the duties of the host branch as well as designating the responsibilities of the other member branches. The N.E. Regional is scheduled for April 7, 1956. Suggestions as to the specific topics to be presented at the educational session were solicited. The Bridgeport branch has been assigned the responsibility of securing the required publicity for the affair. This involves the sale of advertising in the program as well as other publicity activities.

Christmas Dinner Dance—**Frank Richards,** chairman, announced that all details had been arranged for this affair. In addition, he announced that a raffle would be operated simultaneously, subject to the granting of a permit from local and state authorities. Until that permit is granted no attempt should be made to dispose of the raffle books. In any event the use of the mails for distribution of same is prohibited. He also stated that he would underwrite any loss incurred in the operation of these affairs.

Old Tymers Nite—**William Ehrencrona,** chairman, reported no activity because of a delay in notifying him. However, he pointed out that there was plenty of time to arrange for same.

Bob Onkey, stricken with polio, was slightly improved but was still a very sick person. He had been removed to Roanoke Memorial Hospital, Roanoke, Va. All members were urged to send him a message of cheer. His being away makes him doubly lonely. **Bill Hyatt's** wife unfortunately lost her first baby at childbirth.

The discussion of the recommendation by the Board of Managers to consider raising the dues to meet the increased operating expenses of the branch was tabled pending the report of the success or failure of the Xmas party and the raffle.

At this time the business meeting was recessed to permit the featured speaker of the evening, **William Innis** of MacDermid Inc. to present his topic "Aluminum Metal Finishing." His subject was presented more in the nature of a round-table discussion rather than a formal presentation. Samples of various finishes on aluminum were distributed throughout the audience and questions on the methods employed in obtaining these finishes were invited from the members. After many specific questions relative to these finishes were asked and answered, Innis received a rising vote of thanks for his time.

A motion was made and passed that breast pocket cards be supplied to the attending members at future meetings. These would have a dual purpose—to permit easy identification of members by those who are comparatively new in the organization, and the removable portion would serve as an opportunity to win a door prize. **Geo. Eckholm** volunteered to donate the first prize. Late adjournment did not permit television viewing of the scheduled fight. Raffle tickets were distributed. Refresh-

BOB PARKER

BUFFALO

Kahler on Cd Plating

Harold A. Kahler, assistant to the vice-president, Promat Division spoke at the November meeting of the Buffalo branch. His subject was "Present Practices and Probable Trends in Cadmium Plating."

Frank Rudolph and **Hy Fudeman** were appointed delegates to the Niagara Frontier Technical Society. **Joseph Ruff** was appointed chairman, and **Harold Day** to the sick committee.

Visitors were: **J. August,** Waukegan, Illinois; **Don Blum,** Rochester, N. Y.; **H. Carlson,** Jamestown, N. Y.

J. Scholterer reported that everything was ready for the Christmas Party Dec. 2, 1955 at 9:00 P.M. There was a gift for each lady. **Grag Simon's** orchestra furnished the music. A buffet luncheon was served. Ticket committee: **Charles Fothingham, Ray Blechinger, Bert Kirchoff** and **Si Bush.**

ERIC G. SAMPSON, JR., Secretary

CAPITOL DISTRICT

Tucker Talks on Research Board

On November 7, twenty-nine members and guests of the Capitol District branch attended the regular monthly meeting at Panetta's Restaurant in Menands, N. Y.

Tucker

Edward Raymond, the branch librarian, introduced the guest speaker, **William Tucker,** head of plating and metal finishing at the Kodak Park Plant of Eastman Kodak. Tucker is very enthusiastic about the AES Research Program and presented an interesting talk on this subject. His talk included the history of the AES Research Program, the functions of the Research Committee, the personnel required to investigate a project, and a run-down on the status of current Research Projects. Tucker s t the most difficult problem facing the R search Committee is to decide upon a research program which will benefit the most people.

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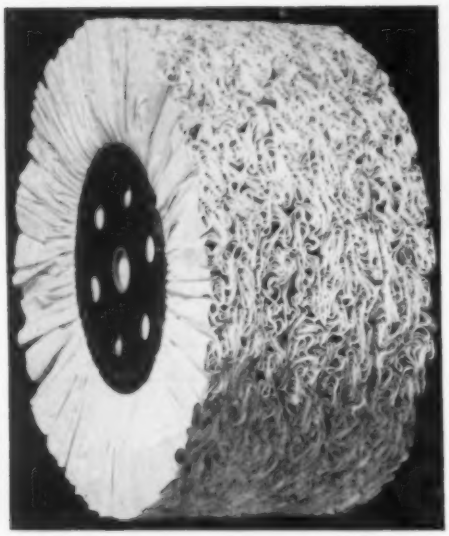

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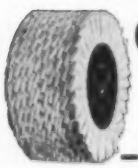

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BRANCH NEWS

Chester Klimek, chairman of the research finance committee, thanked his committee for the support they gave him during this recent drive to increase the branch's sustaining members. The committee included **Paul Callahan, Raymond Dunlevy, Theodore Duvall, Peter Greco,** and **Frederick Infield.**

Edward Wheeler, chairman of the law committee, suggested that the members bring their by-laws with them to the next regular meeting so that revisions to the by-laws can be discussed and voted upon.

Merle Shaw, chairman of the entertainment committee, reported that all arrangements have been completed for the Christmas Party which will be held at the DeWitt Clinton Hotel on December 10. A gala affair has been planned with a cocktail hour commencing at 7 P.M.

Last month, the Capitol District branch's membership reached the half-century mark with the election of **Donald Kollath** and the transfer of **Bob Wolf** from the New York City branch.

CHARLES SCHENK, JR., Secretary

CENTRAL MICHIGAN

Hesler on Waste and Water

Hesler

Twenty three members of the Central Michigan branch met on November 8, at Hotel Porter, Lansing, Mich. After an excellent dinner and a brief business meeting the librarian, **Dave Trafelet,** introduced the speaker of the evening, **J. C. Hesler** of Industrial Filter & Manufacturing Co., Chicago, Ill. who gave us a very informative talk on the use of demineralizers for treating of water for plating and for treating plating room wastes. A spirited question period followed.

G. S. WOODRUFF, Publicity

CHICAGO

Activities Reflect a Vigorous Branch

Chicago branch has always looked upon **Leonard Weeg** of National Lock Company as an old and respected friend, and when he appeared before them as a speaker for the November meeting, he discussed an old subject, yet managed to give it a "new look." With the emphasis now upon brass finishes for modern design there is a renewed interest in improving brass plating techniques. Though Weeg's approach to the subject was "Brass Finishes on Hardware," his coverage was applicable to all phases of brass plating. The stress was on modern methods for meeting tight production schedules while still maintaining quality and uniformity.

Weeg

Weeg (who was assisted in this presentation by **Gail Pearson,** plating foreman at National Lock Company) has been an active participant in the affairs of the Society for many years, having served on Research Committees, the Educational Board, etc. His academic preparation was received at the University of Illinois. After graduation he spent eleven years with the American Nickeloid Company as research and production engineer. The next four years were spent at C. G. Conn. Ltd., as chief chemist. For the past seven years he has been with the National Lock Company as superintendent of their Finishing Division.

Specialists in Metal-Cleaning Products

Samuel H. Davis, general foreman, checks finish on bumpers.

Rheem Automotive Company cuts production costs with Wyandotte B.N.

The Rheem Automotive Company, of Vernon, California, is a leading manufacturer of automotive springs and bumpers. Its new plant, now under construction at Fullerton, California, will house the largest plating installation on the West Coast.

Because of its high manufacturing standards, Rheem insists upon high quality from all its suppliers. In the manufacture of automobile bumpers, where a gleaming finish is so important, great care must be exercised in the metal-cleaning operations. Wyandotte B.N. helps make this job easier and more economical.

Wyandotte B.N. is a versatile cleaner that does many jobs well. Rheem Automotive Company uses it as a soak cleaner, and as both an anodic and cathodic electro-cleaner. They report excellent cleaning results. Wyandotte B.N. helps them keep cleaning costs low, too, because it has an exceptionally long cleaning life. And, with Wyandotte B.N., rejects are cut to a minimum!

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BRANCH NEWS

In commenting on the problems involved in brass plating, Weeg informed us that red heads are detrimental to brass finishes—he didn't know why but says, "Honestly."

The experts' panel for this meeting was replaced by a very informative discussion and actual demonstration of pump packing techniques conducted by **Harold Faint** of Frederick B. Stevens, Inc.; **Ray Ledford** of Industrial Filter was ill and could not participate as planned in demonstrating the Cut-Away Unit, but promised to bring it before us at an early date. Among the points Faint covered were—placement of packing, alternating ring splits, location of lantern gland and use of water seal and restriction to 5 to 10 lbs head.

Questions asked were on:	Answers were:
Packing Life	1 week to 1 month
Why Teflon Melts	Too Tight
Grease vs Water to keep air from solution	Water is best

Ledford

V.P.'s are now beginning to be V.I.P.'s in private local affairs as well as in National Public affairs. The vice-president of Chicago branch, **Ralph Pettit,** of Diversey Corp., aside from being an active participant in the usual business of the branch has, as chairman of the membership committee, added many new members as well as adding new vigor to the branch. In fact Chicago branch has an unusually fine team of executives this year, headed by a progressive-minded president, **S. P. Gary, Jr.,** of Grunwald-Hard Chrome Plating Division.

Gary now extends to all friends of Chicago branch, AES, a cordial invitation to attend its 44th Annual Educational Session and Banquet to be held Saturday, January 28, 1956 at the Conrad Hilton Hotel in Chicago. The branch librarian, **Dr. Russell E. Harr** of Western Electric Co., has planned an excellent program for the afternoon, headed by **R. S. Wysong,** of Studebaker-Packard Corporation, as moderator with the following speakers:

1. "Engineering Uses of Plated Coatings"—**Phil J. Ritzenthaler, president,** Plating Engineering, Milwaukee, Wisconsin. This discussion will feature problems encountered in engineering applications of electrodeposits and typical solutions.

2. "Decorative Anodizing"—**Joseph M. Andrus,** chief chemist, Croname, Inc., Chicago, Illinois. Decorative anodizing is rapidly becoming a popular answer to troubles caused by the short supply of nickel anodes. Here is an opportunity to hear an excellent discussion of this corrosion resistant finish.

3. "A Progress Report on Accelerated Corrosion Tests for the Performance of Plated Coatings"—**Walter Pinner,** executive staff engineer, Houdaille-Hershey Corporation, Detroit, Michigan.

As chairman of Research Project No. 15 for AES, Pinner has a report of more recent findings than those presented at the Cleveland Convention. The Society is indeed fortunate to have the services of Walter Pinner for this important project. His many years of experience in conducting performance tests of decorative plated coatings under a wide variety of outdoor exposure conditions eminently qualify him for directing and coordinating the innumerable tests involved in this investigation.

For the evening, the banquet chairman, **R. Scott Modjeska,** of Scientific Control Laboratories, promises an unusually gay evening beginning with an excellent dinner, followed by a star-studded show M.C.'d by **Lou Breeze.** To complete the evening there will be dancing to the music of Lou Breeze and his orchestra.

JEROME KUDERNA, Publicity

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BRANCH NEWS

COLUMBUS

Tri-State Regional Meeting Discussed

The regular monthly meeting of the Columbus branch was held on Friday, November 4, at Battelle Memorial Institute at 8:00 P.M.

President **Nathan Koslin** called the business meeting to order.

The minutes of the October meeting were read and approved.

President Koslin read the proposed Tri-State Regional by-laws and appointed **Doug Gordon** to replace **Larry Noll** as a representative to the permanent Tri-State Committee. After a discussion of the proposed by-laws it was the consensus of opinion that these by-laws should be changed as follows: 1. The purpose of the Tri-State Regional should be included. 2. Limits should be set on the treasury. 3. Some method for the distribution of any profits should be devised.

Tri-State Representative **Walter Denney** was so advised.

President Koslin then asked Walter Denney to introduce the speaker of the evening, **Alfred Pope** of the Pennsylvania Salt Mfg. Co., whose topic was "Trouble Shooting in Cleaning Operations."

Following a question and answer session, and a round of applause for the speaker, the meeting was adjourned in favor of coffee and donuts by **Don Swickard.**

MICHAEL FARR, JR., Secretary

DAYTON

Tri-State Regional, NCR and Metal and Thermit

The regular November meeting was held at the Hotel Biltmore. One new member was elected **Jack R. Blair,** chemist, Finishes Laboratories, National Cash Register Co.

Robert Ruleff, chairman, By-Laws Committee of the Tri-State Regional Meetings reported that they have now reached agreement and that ratification by the member branches is expected soon.

Librarian, **Bernie Cohen** introduced **John Easton,** Dayton branch member of National Cash Register Co. who gave a short talk on "Copper Plate for Heat Treat as used at NCR."

Dr. Frederick A. Lowenheim, supervisor of electrochemical research, Metal and Thermit Corp., Rahway, New Jersey was next introduced. His topic was "New Developments in Tin Alloy Plating." Tin-zinc, tin-copper, tin-nickel were the main alloy plates and baths discussed. The considerable interest in this subject was borne out by the numerous questions asked. Dr. Lowenheim was given a rising vote of thanks for his fine presentation.

After the meeting the 31 members and friends were treated to refreshments through the courtesy of United Chromium, Inc. and their local representatives, **Elmer W. Rehme** of Cincinnati, and **J. G. Walker** of Lebanon and member of the Dayton branch.

R. M. CLINEBENS, Secretary

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BRANCH NEWS

HAMILTON

Reminiscences by Dr. Wernlund

On Friday, October 21, the Hamilton branch held its monthly meeting at Fischer's Hotel with twenty-three present. **Dr. C. J. Wernlund** of the Dupont Electrochemical Department, Niagara Falls, N. Y. was the guest speaker. Everyone enjoyed his entertaining and educational address on "Reminiscing in Cyanide Electroplating." Thirty-five years' experience in this field made Dr. Wernlund most able to speak on this subject. He brought greetings from the Buffalo Section and offered helpful suggestions to encourage branch membership and attendance at meetings.

N. A. Graham, Secretary

HARTFORD

Dr. Saubestre on Electropolishing

The regular branch meeting was held at the Bond Hotel on November 21 and about 63 members and guests were present. Prior to the meeting, a colored movie entitled "Science for Making Brass" was shown.

Saubestre

The guest speaker for the evening was **Dr. E. B. Saubestre,** chemistry department of Sylvania Electric Products, Inc., Flushing, N. Y., whose subject was "Electropolishing."

Dr. Saubestre quickly reviewed the early history of electropolishing including the work of **Jacquet** on the perchloric-acetic acid bath and the Battelle Institute on the phosphoric-sulfuric and chromic acid baths. Some of the shortcomings of the earlier baths were the high currents required, short life of the bath, solution cost and non reproducible results. The latest development is a bath using acetic and hydrochloric acids or sulfuric and hydrochloric acids which produce perchloric acid during electrolysis right on the surface being electropolished. These new baths use cheap chemicals, are more stable, have a wide current working range, current efficiency is good, have good throwing power, good conductivity, safe to use, can be used on most metals with rather poor results on copper and aluminum. Used to replace mechanical polishing, deburring, in metallography, preparation prior to plating or other finishes and for precision finishing or machining.

The technical chairman for the evening was **Harry Sanders.**

Stanley Platoz, Secretary

KANSAS CITY

Films and a Speaker on Research

The meeting was held at the Berkshire Hotel on October 27, with 26 members and guests present.

Following dinner, the business meeting was called to order. A discussion was held regarding the Christmas party. It was agreed that arrangements be made to combine our annual Christmas party with that of the American Society of Metals.

Announcement was made that the next meeting would be November 10, and following meeting will be held the 2nd Thursday of each month.

Librarian, **Hank DeWitt,** presented a film covering the manufacture and uses of abrasives which was followed by Hank giving a very informative dissertation of the practical aspects of the Fundamental Laws of Electroplating.

Another meeting was held at the Berkshire Hotel on Nov. 10, with 20 members and 5 guests present.

The meeting was opened with a discussion regarding new members, Christmas Party and attendance.

The showing of an entertaining film by librarian Hank DeWitt was followed by the speaker of the evening, **David Benderski.** Benderski talked about the work being accomplished by the Midwest Research Institute in the midwest area.

Following a short discussion session, meeting was adjourned until December 14.

OLIN BOCK, Secretary

LOS ANGELES

Krentel Suggests

The first fall meeting of the Los Angeles branch of the AES was held on Wednesday, Sept. 14, at the Rodger Young Auditorium. Meeting was called to order by president **Earl Arnold** at 8:40 P.M. with 80 members and guests present.

Eight guests were introduced by the sergeant-at-arms, **Pete Estew.** After the secretary's and treasurer's report was read the membership chairman **Truman Stoner** introduced six new applicants for membership in the branch. Three new candidates were installed as members.

Joe Lavoy requested information regarding the AES research program to use as ammunition for obtaining more sustaining members.

The delegates were instructed to have a meeting and report on the national convention at the October meeting.

Krentel

Past president **Krentel** suggested that the secretary write the national office regarding the articles appearing in the magazine PLATING. He felt that newer and better articles could be presented: not just papers of the convention as the members receive them in their copy of the proceedings. After a lively discussion pro and con it was decided that the members offer these suggestions in writing so that a letter could be drafted and sent to the editor of PLATING.

The librarian then introduced the speaker of the evening **Harold Kahler,** assistant to the president of Poor & Co. who presented a very interesting paper on "Chromate Coatings." After a discussion period, meeting was adjourned at 10:00 P.M.

The October meeting of the Los Angeles branch was called to order by president Earl Arnold at 8:50 P.M. with 128 members and guests present.

Due to the lateness of the hour and the large crowd attending, president Arnold cut the meeting short with just the secretary and Treasurer's report being read and approved and a report by the membership chairman and the research chairman. The delegates were instructed to give a report of the convention at the November meeting.

The meeting was then turned over to the librarian who introduced the speakers of the evening: **Ercell Stevens** of the Norton Co., and **Dr. David H. Green,** chief chemist of the Mido Products Co., who presented a joint lecture on "Barrel Burnishing & Deburring." After a lively discussion period, meeting was adjourned at 10:15 P.M.

GEORGE J. HETZ, Secretary

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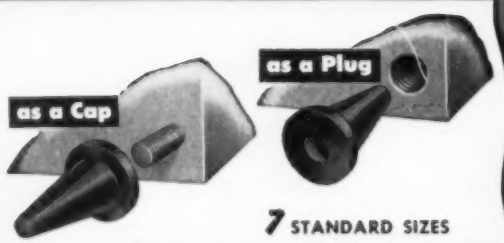

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BRANCH NEWS

LOUISVILLE

Blee Looks at Tomorrow

The regular monthly meeting of the Louisville branch was held Thursday, September 15, at Kapfhammers Party House, Louisville, with a dinner served at 6:30 P.M. Librarian, **J. S. Houston** opened the business meeting at 8:00 P.M., with 21 members and guests present.

The Membership Committee reported one application for membership.

The technical sessions chairman, J. S. Houston reported that the October meeting will be a Ladies Night—Special Program Meeting. We will have **R. W. Blee** of the Appearance Design Department, General Electric Company, Appliance Park, Louisville, Kentucky, as the speaker and also slides and movies. Corsages will be given to all of the ladies present through the courtesy of the Liberty Engineering Company, Louisville, Kentucky.

Application for Membership was received from **Joseph P. Doherty,** Knoxville, Tenn.

A letter was received from **William W. Francis**—president of the Louisville branch, requesting resignation as president, due to moving to Phoenix, Arizona, to accept a position as plant manager there.

A letter from **N. C. McCune**—2327 Manchester Road, Louisville 5, Kentucky, requesting resignation from the branch, as no longer connected with the plating industry. The resignation was accepted in accordance with the Rules and By-laws of the Constitution.

James R. Smith and **Richard G. Marshall** delegates to the Tri-State Regional Meeting submitted a report and the By-laws of the Tri-State Region, AES. Considerable discussion followed the report and J. S. Houston, presiding officer, asked for a motion. A motion made by **P. H. Pate** and seconded by **J. R. Smith** to accept the By-laws as reported was approved by the membership.

The treasurer's report was read and accepted.

Technical session chairman, J. S. Houston after a brief talk introduced **Frank Lisowski** of the Wagner Bros., Inc., Detroit, Mich., as the speaker of the evening. Lisowski in his talk on "Automation As Applied to Electroplating," stressed the importance of having automatic machinery where lower costs, high production, quality of work, and profits are desired. Considerable discussion followed and Lisowski was given a rising vote of thanks for a very interesting talk.

Film entitled "Production of Aluminum" was shown.

The Louisville branch held a Ladies Night—Special Program Meeting on Thursday, October 20, at Kapfhammer's Party House, Louisville, with a dinner served at 6:30 P.M. Vice-president **K. C. Reifsteck** opened the meeting at 8:00 P.M., with 26 members and guests present.

Since this meeting was especially prepared as a social with the ladies present, vice-president C. Reifsteck decided to dispense with the formalities of the business meeting. At this time he introduced **Stanley J. Beyer** as chairman of the night's program.

After this session, Stanley J. Beyer introduced our esteemed speaker of the program, R. W. Blee, Designer of the Appearance Design Department, General Electric Company, Appliance Park, Louisville. The subject of the talk was "Tomorrow's Ideas Today."

The members and guests present were as follows: **R. W. Blee,** guest speaker; **Mrs. Stanley J. Beyer, Mrs. William Young, Mrs. John W. Scholl, Mrs. R. G. Marshall, Mrs. H. D. Bowsher, Mrs. K. C. Reifsteck, Mrs. William Dawson, Mrs. M. L. Matthews, Mrs. Ray Shalleross, Mrs. Ken Dale, H. G. Peters, Ed. Bruck, H. W. Kennedy,** and **Art Oertel.**

BRANCH NEWS

Robert W. Blee, A.S.I.D., an industrial designer with the Appearance Design Section, Major Appliance Division, General Electric Company, Louisville, Kentucky, was the guest speaker for the evening. The title of Blee's talk was "Tomorrow's Ideas Today."

He described how a major appliance is designed by a team consisting of engineers, manufacturers, product planners, and appearance designers. This team, backed up by Marketing Research, which reflects the consumer's point of view, contributes their talents toward the product, i.e., the appliance that comes off the assembly lines at Appliance Park.

Blee pointed out that the designers and engineers must work at least a year to two years in advance of the market on product lines and from three to ten years ahead in their development design. To be successful at the market place, the product must be in tune with current market trends as well as be satisfying to the customer in performance and appearance. As Blee pointed out, the consumer is the final judge of good design.

Blee, a member of the American Society of Industrial Designers, illustrated his talk with drawings and slides illustrating the process of industrial design as practiced in a corporation design office. These showed design ideas in sketches, finished renderings, full size mock-ups, and models used in developing design. They included slides of full size final appearance models which must precede the actual tooling for production. These are necessary because tooling on the final product may start a year before the public ever sees the product.

Once the product is in production, most of the efforts of this large design team are focused a year or two ahead to the next models. Before the consumer ever sees the new models, they are old to this design team that brought them into being because design is always concerned with tomorrow's product today.

The meeting was adjourned at 9:30 P.M.

J. G. STERLING, Secretary-Treasurer

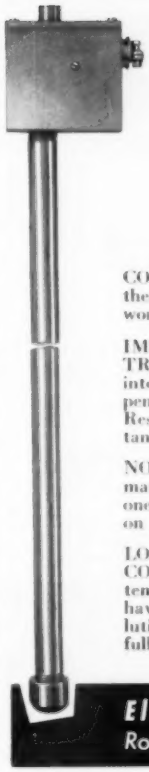
NEWARK

A New Film; Brenner on Research at NBS

A meeting of the Newark branch was held on November 18, at the Robert Treat Hotel. Elected to membership were **Sydney Willoughby** of Weston Electrical Instrument Co., and **Arthur Atwater** of the Bell Telephone Laboratories, Inc. The resignation of **Wm. W. McCord,** a member of the AES for some 30 years was regretfully accepted and **T. A. Downey** was transferred to the Grand Rapids branch. President **Austin** called upon **Wm. Grigat** for a report on the Christmas Party to be held in December. He reported the arrangements almost complete, a three-act floor show scheduled, a roast beef dinner planned and a good time guaranteed. **George Wagner** said the tickets would go out next week and **Don Foulke** asked those receiving Boosters' letters to reply promptly. **Dodd Carr** reported that three classes remained in the Fall Electroplating School with attendance continuing at a high level.

Brenner

Following the showing of the interesting film "A Brighter Tomorrow" by the Bart-Messing Enterprises, librarian **Gustave Bittrich** then introduced **Robert Horrocks** who described the Bendix Teterboro plating room recently completed, including the special engineering and tank arrangement.



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BRANCH NEWS

Dr. Abner Brenner then described "Research at the Bureau of Standards." Starting with the origin of the Electrodeposition Section under **Dr. Blum,** the speaker outlined the scope and growth of the section over the years. Dr. Brenner then reviewed recent work including the electrode position of metals from non-aqueous solutions, using fused salt and organic electrolytes, permeability studies and later radioactive and X-ray techniques; protecting magnesium from corrosion, touching upon the HAE Process, Dow No. 17 and the Bureau's alkaline dichromate solution; and the protection of molybdenum at high temperatures by use of chromium plus nickel barriers. Dr. Brenner also touched briefly upon electrophoretic deposition of colloid materials.

The interest of the 68 members and guests was shown by the many questions raised. Among visiting dignitaries was PLATING editor **Archimedes Doria.**

D. GARDNER FOULKE, Secretary

NEW HAVEN

A Course; A Party; 2nd V.-P. Eddy

The November meeting of the branch was held on the eighth of the month at the Mason Laboratory, Yale University.

President **William K. Murray** opened the meeting with the roll call of officers and all were present.

Eddy

A discussion followed in regard to the Ladies Christmas Party to be held on December 3 in the Three Cups Inn, Meriden, Conn. The membership decided on favors for the ladies; it is expected the $3.50 cost per ticket will defray all expenses. A choice of chicken, turkey, ham, sword fish or lobster is available for dinner starting at 7:00 P.M.

Ed Foley gave a report on the Electroplater's course to be given in New Haven Teacher's College starting the first week in Feb. It will run for a 15 week period and has been divided into topical sessions covering chemistry, solutions, shop practice, etc.

Technical chairman, **Ed Busby** then introduced the speaker of the evening—AES 2nd vice-president, **Francis T. Eddy,** general manager of Technicraft Laboratories whose topic was "Plating Room Layout." A lively question and answer period followed.

The door prize was donated by Ed Busby of Time Chemical Corp.

B. J. GAFFNEY, Secretary

PHILADELPHIA

A Book is Bought; A Speaker Speaks, Dr. Heiman's Class Listens

A regular meeting was held on October 24 at The Engineers' Club with 50 attending dinner prior to the meeting. Hanson-Van Winkle-Munning Co., through **Howard Wright,** generously donated the beer served during the meal.

The meeting at 8 o'clock heard reports from officers and committees. Through a recommendation of **Albert Hirsch,** Supreme Society Honorary Member, the branch voted the purchase of a copy of "Electroplating Engineering Handbook" to be donated to the Reference Section of The Free Library of Philadelphia.

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BRANCH NEWS

Clarence Helmle, Enthone, Inc., presented color motion pictures of his trip to Mexico with interesting commentary by him.

Philadelphia Annual Speakers on November 19: (l. to r.)—R. F. Leach, chairman; AES 1st Vice President S. Heiman; H. Strow; Branch President W. H. Trusdell and Dr. A. K. Graham

The main speaker was **William Murray,** Enthone, Inc., whose topic was "Adhesion of Electrodeposits and New Methods of Cleaning and Oxide Removal." He showed, by means of slides, how perfect adhesion resulted when there was a continuation of the base metal crystalline structure into the electrodeposit. Also shown were the effects of machining, polishing and buffing on surface layers, the structure and effects of crystalline and amorphous layers. He discussed the effects of various cleaning and etching methods on the removal of the surface layer. He concluded with a demonstration of the alkaline derusting method promoted by his company.

The class in electroplating at Temple University, conducted by **Dr. Samuel Heiman,** was present to hear Murray.

Philadelphia Holds Its Annual Banquet and Educational Session

The annual banquet and educational session was held on November 19 at the Benjamin Franklin Hotel. The educational session, which started at 2:15 P.M., was chairmaned by AES first vice-president Dr. Samuel Heiman. Guests introduced included: AES third vice-president **Herberth Head;** president of New York branch, **Al Fusco;** Newark branch secretary **Don Foulke** and AES executive secretary **P. P. Kovatis.**

The first speaker was **Richard F. Leach,** General Electric Co., who spoke on "Germanium Rectifiers for Plating Applications." He explained that the core of the rectifier was a wafer made of germanium, coated on one side with antimony, on the other with indium. The wafer of low mass was mounted on a copper block to remove heat generated during the rectification process. Germanium rectifiers consistently produced current at 93 per cent efficiency with no aging problem.

The second speaker was **Henry Strow,** True-Brite Chemical Products Co., whose subject was "Advanced Techniques in Copper Plating." The scope of his presentation was limited to a discussion of the "work-horse" copper plating solution of the plating room—the straight cyanide copper solution. The following was given as a standard barrel plating formula: copper—5.0, free cyanide (sodium)—2.5, caustic soda—0.5 to 2.0 oz/gal. The efficiency was slightly lower than 100 per cent; temperature—130 to 150° F (100° for plastic parts); voltage—12. For use as a high speed barrel solution, the following was recommended:

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BRANCH NEWS

copper—10.0, free cyanide (as sodium)—4.0, caustic soda—1 to 4 oz/gal; temperature and voltage were the same. This solution could draw as much as 600 to 700 amperes per barrel load, with sufficient anodes being the main concern. The same compositions may be used for still tank plating. Lead in the form of potassium plumbate (made by dissolving lead oxide in potassium hydroxide solution) may be used as a brightener, the concentration in the plating solution being between 2 to 4 mg/l. No sodium thiosulfate or other sulfur bearing compound should be added to a copper solution that contains lead.

Also discussed were potassium baths, the various types of copper anodes, the effects and removal of various contaminants.

The third speaker was **Dr. A. Kenneth Graham,** Graham, Crowley and Associaties, who spoke on "New Concepts with Respect to the Use of Nickel or Nickel-Chromium Coatings." Dr. Graham stated his disagreement with the concept of the existence of pores in an electrodeposited coating in order for corrosion to take place. Based on exterior corrosion tests on bumpers and nickel foils separated from the base metal, it has been shown that much of the corrosion started from the outside, not with the junction of the coating and the base metal. Metallurgical examinations of failures revealed corrosion of copper undercoating underneath holes in top nickel coating, which contrary to accepted theories, could be explained only by the copper being anodic to nickel. This was proved by experiment. Heavy coatings of buffed copper under nickel hold up well because of more copper that may be corroded before the steel becomes exposed. Also, highly buffed copper surfaces, properly cleaned, present more uniform surfaces with less opportunity of the top nickel coating being attacked by the environmental corrosion conditions.

A question period in which all the speakers participated concluded the educational session.

The banquet held in the Crystal Ballroom was attended by more than three hundred. A turkey dinner was served, many door prizes given away, an excellent floor show was seen followed by dancing until midnight.

Acknowledgment is made of the material assistance given to the branch by the advertisers in the program and the donors of door prizes, which assured in no small measure the success of the affair.

I. Wm. Marcovitch, Secretary

PITTSBURGH

A Free Dinner, Four New Members and a Sample Talk

The November meeting of the Pittsburgh branch was held in the Avalon Room of the Sherwyn Hotel on November 2. At the

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dinner preceding the meeting. **Ed Smith** won a free dinner by being present.

Sample

At a short business meeting, we were pleased to welcome four new members into our branch, **Elmer A. Lord, A. John Cornish, Collin F. Stevens** and **Ty Nitsche**.

Since there was no new or old business the meeting was turned over to librarian **Jim Crain** after a few announcements. Jim introduced our speaker for the evening, **Clarence H. Sample** of the International Nickel Company, Inc., who talked on "Corrosion Behavior and Protective Value of Electrodeposited Coatings." Clarence's fine talk was well illustrated with a set of beautiful colored slides.

After a short pause for refreshments, Clarence drew the name for the door prize. **Charley Forbes** was the fortunate winner of a beautiful chafing dish presented by **Carl Reinheimer** of Westinghouse Electric Corp., Electroplating Projects Department. After a lively discussion period the meeting was adjourned.

HERB SCHRAM, Secretary

PROVIDENCE-ATTLEBORO

Bright Silver Plating by Dr. Foulke

The regular monthly meeting of the Providence-Attleboro branch was held Nov. 21, at the Engineering Building, Providence, R. I.

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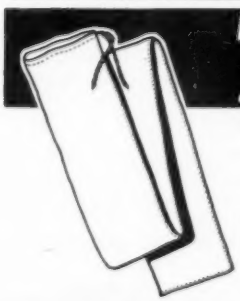

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BRANCH NEWS

Foulke

The meeting was called to order by **Peter Lonsbury,** president, at 8:20 P.M.

Gerald Noonan, chairman of the Christmas party committee, reported the party would be held at Wayland Manor, Dec. 12, at 7:30 P.M.

Oscar Binder offered his collection of PLATING magazines to any interested member.

P. Lonsbury introduced **D. Gardner Foulke,** of the Research and Development Department, Hanson-Van Winkle-Munning Co. The subject of Dr. Foulke's talk was "Bright Silver Plating."

Silver plating originated in 1838 with brightness first being used in 1847. Originally silver plate was always buffed for finish but bright silver solutions have minimized finishing costs. The silver and cyanide content of plating baths has increased from relatively low concentrations to high silver (5–6 oz/gal) and cyanide (12–14 oz/gal). Potassium nitrate has been found to permit lower free cyanide and open the current density range for bright plate. The bright silver plates are harder and have better covering power than the older types of silver plate.

A certain amount of control work must be done to maintain a bright plating solution but this is not difficult to perform.

Periodic reverse may be used with bright silver plating solutions. Good leveling may be obtained with a 60 second forward and 45 second reverse. However, no reduction in plating time will result although high current densities are used. The loss of time due to reverse plating eliminates the advantage that is normally obtained with high current density.

F. L. SHERMAN, Secretary

SAGINAW VALLEY

A Speaker, Past President's Night, and Herberth Head

Seventy-nine members and guests attended the November meeting at Zehnders Hotel in Frankenmuth on November 9.

Head

The guest speaker of the evening was **Ralph E. Hale** of the J. J. Siefen Co. His topic was "Liquid Buffing Compounds."

Past Presidents' night was also observed.

Herb Head, AES Third Vice-President, attended. He was introduced to the members and he gave a short talk.

A door prize was donated by the J. J. Siefen Co. and was won by **Sundwick** of Ternstedt Div. of G.M.

A. A. KNIGHT
Recording Secretary

ST. LOUIS

Joe Day on Rectifiers

The November dinner meeting of the St. Louis branch was held at the York Hotel with 27 present for dinner.

The business meeting was called to order by president **Hunleth** with 39 members and guests present.

The minutes of the previous meeting were read and approved.

Two new members were accepted: **Walter Snow** of General Electric; **Melvin Roustio** of New England Lead Burning Corporation.

Our speaker of the evening was **Joe Day** of Udylite Corporation, who discussed "Trouble Shooting in Rectifiers." He gave many helpful hints which would enable platers to eliminate

BRANCH NEWS

common faults. His talk was illustrated by blackboard diagrams and covered magnesium copper sulphide, copper oxide, selenium and germanium rectifiers. The numerous questions indicated the interest everyone had in the talk.

The meeting was adjourned after a rising vote of thanks to Day for his excellent talk.

WARD W. KELLY, Secretary-Treasurer

SEATTLE-PUGET SOUND

The Fall Report is Good

The September meeting was a report of the delegates to the Convention at Cleveland, the highlights mentioned were of interest to the stay-at-homes.

Combs

The October meeting was made interesting by **Elburn Marcum** of E. I. Du Pont Company, and he spoke on "Cyanide Plating," with an extended question period following the meeting.

The November meeting presented **Eugene Combs** to the gathering; and, the book review on Chromium Plating, which he gave was of interest as indicated by the questions asked concerning the book as well as about chrome plating in general.

The attendance has been about 40 to 45 persons at each of the above mentioned meetings.

Several new applications have been received and two more are being processed and will probably be accepted next meeting.

MRS. HELEN ARCHIBALD, Secretary

PATENT ABSTRACTS

No. 2,721,813, October 25, 1955—Galvanizing Method—T. Holmberg, assignor of half to G. Gronblom, Helsingfors, Finland.

A method of separating zinc in iron-zinc alloys, dross, etc., consists of introducing such iron-zinc bearing materials into a molten lead bath, maintained at 600° C. The zinc dissolves in the lead and the iron floats on top and is separated from the lead bath. When the temperature is dropped to 420°–460° C the zinc separates out on top and can be removed.

4 claims, 1 figure.

—AES—

No. 2,721,814, October 25, 1955—Nickel Plating by Chemical Reduction—H. Jendrzynski and T. Stapleton, assignors to General Motors Corp., Detroit, Michigan.

The chemical nickel reducing bath claimed contains nickel ion less than about 10 g/l, hypophosphite ion less than about 25 g/l, a temperature range of 165°–190° F and an initial pH of 5.8–7.2. Claim 2 describes the nickel ion as being provided by nickel acetate. All claims describe keeping the article in the bath until substantially all the nickel is deposited.

Example 1 of six given is:

Nickel acetate $.4H_2O$	16.7 g/l
Nickel hypophosphate $.H_2O$	20.0 g/l
Temperature	182° F
pH	6.8
Work load	0.06
Reduction completed	4 hr.
Ave. plating rate	10.5 mg/cm²/hr.

4 claims.

Filter your solutions!

*Reg. App. for

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Self-priming Model LSIN-10... Cap. 100 gal/hr H.T. Lucite Filter Assembly. Stainless pump . . . totally enclosed Motor . . . portable . . . Wt. 60 lbs . . . 12" x 14" x 16" high.

. . . Distributors in principal cities. . . . *Write for literature.*

PARTIAL LIST OF MODELS

Model	Rated Capacity	Overall Size	Weight
LSI-5	50 gal/hr	11"x14"x12"	30 lbs.
LSI-10	100 gal/hr	12"x16"x16"	40 lbs.
ASI-300	300 gal/hr	2'x2'x2'	125 lbs.
ASI-600	600 gal/hr	2'x2'x2'	150 lbs.
RLS-1200	1800 gal/hr	2'x3'x3'	300 lbs.

SERVICE . . . Filters practically any acid or alkaline solution from pH 0 to pH 14; removes particles down to one micron in size. Strainer stops metallic objects.

DESIGN . . . **Filter Assembly** fabricated of stainless steel 316, high temperature lucite, rubber-lined, Haveg or Sethrin* resin. **Filter Tubes** of cotton, dynel, porous stone or porous carbon. **Pumps** fabricated of Hastelloy, stainless 316 or plastic; centrifugal or self-priming. **Motors** drip-proof, totally enclosed, or explosion proof, 110 or 220 volt, single or three-phase, 50 or 60 cycle, sleeve or ball bearing. **Hose** — special acid and alkali resistant. **Base** — Linen Phenolic laminate on rubber tire ball bearing casters.

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$ 4515—4.5kw, 230 V, 25" long . . 57.00 W/Boot 87.00
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Crucibles, tapered, 5 pint, seconds $4.00 each.

Terms: Net, fob shipping point

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BRANCH NEWS

SOUTHEASTERN BRANCH

Preparations for Education

Our regular monthly meeting was held at the Belmont Steak House, Atlanta, Ga. on November 11. The meeting was called to order at 8:30 with 16 members and guests present, **Clyde Stovall,** presiding. Minutes of our October meeting were read and approved. Preparations for our educational session in February were discussed and found to be getting along very well according to the report from **C. Lewis and Russell.**

Chas. Lewis, then introduced our speaker of the evening, **D. S. Roland** of Sarco Co. Inc. Roland gave a most interesting and illustrated talk on heating and cooling controls explaining the different traps and heat exchangers in a most enlightening manner. Question and answer period followed which was enjoyed by all in attendance. We hope to have him with us again in the future.

Two members were voted on and accepted: **Wm. H. Head,** International Resistor, Arden, N. C. and **Herman Simms,** Shower Door Co. of America, Atlanta, Ga

W. T. Weymouth, Secretary-Treasurer

SOUTHEASTERN

Brilliant All-Star Cast Planned for First Technical-Educational Session by the Southeastern Branch

On February 10 and 11, 1956—at the Biltmore Hotel in Atlanta, Georgia—there will take place the first Technical Educational Session of the Southeastern branch.

Note this extraordinary list of speakers: **George E. Best** (Allied Chemical Dye Co.), **Dr. Dodd S. Carr** (Bart Manufacturing Co.), **C. F. Nixon** (General Motors Corp.), **C. H. Sample** (International Nickel Co.), **Howard McAleer** (Formax Mfg. Co.) and **William Innes** (MacDermid, Inc.)

There will be a dinner-dance on Saturday night, February 11.

This promises to be one of the best "Firsts" of the year. Let's all wish the Southeastern branch the best of luck and attend. There's much to learn (from such a list of speakers) and Atlanta is beautiful.

Y'all come—say the men of Southeastern. Let's.

SPRINGFIELD

Condon Tells of PR Cu Plating

The Springfield branch meeting at Blake's restaurant was held on November 28. The guest speaker for the evening was **James W. Condon** of the Westinghouse East Pittsburgh plant. Condon's subject for the session was: "New Cycles for PR Cyanide Copper Plating." He accompanied his talk with explanatory slides. The talk was interesting, and brought out a number of related questions, even though the membership attendance was low, for the evening. Among our welcome and distinguished guests, it was our pleasure to have with us, **Louis Gagnon** of the Boston branch, who quite ably did a good job of operating the slide projector.

Henry L. Heissfeld, Secretary

TORONTO

Todd on Belt Polishing

The monthly dinner and technical session of the Toronto branch was held at the Royal York Hotel. Thirty-five members were in attendance for dinner and 50 for the technical session.

The speaker of the evening was **D. Todd** of Canada Sand Papers Limited, who spoke on "Belt Polishing." Todd discussed

the construction of belts, the various types and their uses, and the theory behind belt polishing.

The dinner attendance prize was drawn for but was not claimed as the member who's name was drawn was not present. The amount to be drawn at the next meeting will be $30. The door prize and refreshments were supplied by the Diversey Corp. The members were reminded that the annual Electroplaters' dance was to be held on November 25 at the Kingsway Club.

The meeting closed at 9:45 P.M.

J. G. Smith, Librarian

WICHITA

Dat Old Witch H_2 Embrittlement

The November meeting was moved forward two days so as not to conflict with Thanksgiving. The meeting was well attended with approximately 30 members present, including five guests. The guests, **Arthur Hunsaker** of Cessna Aircraft Company; **C. E. LeFors** of Cessna Aircraft Company; **C. F. Abby** of Associated Company; **Tex Rutledge** of Coleman Company; **Lucien Nelson** of Uni-Temp Products Company were welcomed to our society, and it is hoped that they will soon become members. The program for the evening was announced by **Hank Grimme,** librarian. **Dick Balbierz** of the Boeing Airplane Company, Wichita, Kansas, presented an exceptionally well prepared discussion on "Minmizing Hydrogen Embrittlement." Balbierz pointed out that hydrogen is diffused through steel as atomic hydrogen and that this discovery was made some 75 years ago. He pointed out the rate of diffusion is very rapid and that molecular hydrogen is formed with a resultant change of volume thereby causing infinitesimal cracks in the steel. Atomic hydrogen may cause static failure of the part heat treated, plated, etc. As the writer understands it, the minimum atomic hydrogen has threshold quantities approximately two to four parts per million.

Balbierz concluded with the following recommended procedures for reducing hydrogen embrittlement. (1) Use abrasive cleaning; (2) anodic cleaning; (3) keep the clean to a minimum; (4) keep the pickle clean; (5) use fluorborate cleaning; (6) bake parts to be plated to evolve hydrogen.

The question and answer period could well have gone on all night as many questions were answered and we are confident there were still many questions to be asked after the meeting adjourned.

Our president, **Ogle French** spoke for all members in thanking Balbierz for a very enlightening discussion.

F. B. Swift, Secretary

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Nickel anodes up to 93 inches in length—cast in new shell mold process. This unique method of casting produces anodes of the highest purity—with optimum metallurgical properties. Density of anodes is at a maximum and excellent surface is obtained. These factors account for longer life in plating bath.

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25 Years Ago...

It was 1931. The depression was full upon us. Unemployment was a mounting tragedy which multiplied itself by depressing the economy further. Thousands of publications had ceased to exist or would die in the next few years. The Monthly Review, however, was a strong little magazine that talked of "taking inventory," "a man's worth can be measured by the height of his ideals," and precipitated into "How high are our ideals for the future usefulness of the AES? How deep are our convictions as to the value of our membership in the Society . . . etc." This little magazine (48 pages and no advertising) was looking forward with courage and optimism. It was carrying the banner of leadership for a small membership (circa 1600) through the terrible tribulations of the Great Depression. Small wonder that when the period started to end and we plunged into a global war—the industry was ready to meet the challenge. Here is a lesson in fortitude and devotion to our American Ideals.

Gentlemen, look well to the AES for it is made of such stern stuff.

10 Years Ago...

The terrible struggle was over—on the battlefield. Something of the relief was reflected in The Monthly Review. So was the confusion and the lush spending that took place. This little magazine had 112 pages plus covers. Of that number, 65½ pages were advertising pages.

A full page was devoted to the "Hall of Platers' Contribution to the War Effort," half a page to "Convention News," and the lead article was a translation (by Dr. H. J. Read) of an article by Franz Bollenrath (of Berlin, Germany) which had been published in Luftfahrt Forschung 20, 284 (1943).

The third report of the AES Research Project No. 3 on "Measuring the Degree of Adhesion" was carried.

The advertising showed a healthy differentiation (since it included paint companies, chemical companies, etc.). The narrowing down to an overly-vertical publication must have happened at a later date.

AES Membership Report

ELECTIONS

Baltimore-Washington: L. M. Darrow, A. M. Juskelis, H. W. Scott

Central Michigan: H. E. Welch

Chicago: J. C. Corre, R. W. Dinsmore, R. R. Hawthorne, Jr., W. O. Holzendorf, Jr., J. Jablonski, W. O. Schmidt

Cincinnati: J. G. Canter, R. F. Dean, W. J. Fritz, R. P. Glorius, A. J. Jacobs, J. G. Luchi, R. A. Marquis, R. G. Mustain, Jr., A. J. Schutte, D. C. Stapleton, K. Weber

Columbus: K. J. Cave

Dayton: J. R. Blair

Detroit: R. W. Allen, J. A. Bowen, L. Calhoun, W. O. Carlisle, L. Curley, A. M. Dietrisac, T. A. Gilman, R. Hagstrom, W. H. Morrison, V. C. Nevison, J. Zimm

Grand Rapids: L. W. Check, K. H. Jones

Hartford: R. L. Mullaney, Jr.

Los Angeles: A. D. Baird, J. P. Bylinowski, J. A. Beasley, A. J. Claus, E. J. Corn, Jr., L. Sherman, C. Virginia, H. G. Vorkink, R. W. Warner

Milwaukee: J. Berg, J. Orcholski

Mississippi Valley: A. R. Jackson, R. McKay

Montreal: S. Belsberg, D. Berry

Newark: A. R. Atwater, S. W. Willoughby

Pittsburgh: A. J. Cornish, E. A. Lord, T. Nitsche, C. F. Stevens

St. Louis: M. Roustio, W. A. Snow

San Antonio: R. C. Cripe, D. K. H. Liu, B. R. Owens

Seattle-Puget Sound: J. P. Jacobs, Jack Seymour

Southeastern: W. H. Head, Jr., H. Simms

Syracuse: M. A. Michaels, J. Panto

Toronto: W. K. Wells

Waterbury: A. J. Brazauskas, L. N. Davies, L. E. Lafferty, E. R. Nalband, R. W. Witty

Western Ontario: R. T. Dobson

Wichita: N. H. Madden, H. O. Meserve, Jr., H. E. Wall

Member-at-Large: E. F. Ben-Menachem, Tel-Aviv, Israel, S. J. Georgoulis, Ormond Beach, Florida, R. W. Golledge, Leatherhead, England, Carl Hyde, Waynesboro, Virginia, H. Reis, Birmingham, England

REINSTATEMENTS

Bridgeport: R. J. Peck

Buffalo: K. C. Merrill, (suspended in error)

Cincinnati: D. L. Kaplan, (returned from Armed Forces)

Hamilton: H. Deem

Milwaukee: R. J. Baltzell

Philadelphia: J. W. Christian

St Louis: M. E. Nordman

Member-at-Large: Dr. R. Cransberg, Loosdrecht, Holland

TRANSFERS

Bridgeport: R. Plaisted to Lancaster, J. Tamany to Lancaster

Buffalo: C. J. Martin, from New York

Chicago: D. Kraft, from St. Joseph Valley, J. L. Stoneking, to Mississippi Valley, R. L. Stoneking, to Mississippi Valley

Columbus: C. G. Smith, from St. Joseph Valley

Detroit: A. H. Beebe, Sr., from Member-at-Large, L. E. Glynn, to Saginaw Valley

Grand Rapids: C. J. Byrns, Jr., from Syracuse

Hamilton: J. C. Harden, to Toronto

Milwaukee: R. J. Baltzell, to Southern Tier

Newark: T. A. Downey, to Grand Rapids

Philadelphia: R. W. Priddis, to Indianapolis

Rockford: F. B. Bryant, to Mississippi Valley, L. Kettleson, to Mississippi Valley, H. C. Simon, to Mississippi Valley

Toronto: J. F. Saimoto, to Montreal

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INTERSOCIETY

January 9-10—2nd National Symposium on Reliability and Quality Control in Electronics. Hotel Statler, Washington, D. C.

January 9-13—Society of Automotive Engineers, Inc. Annual meeting, the Sheraton-Cadillac and Statler Hotels, Detroit, Mich.

January 18-20—Society of Plastics Engineers. 12th annual conference, Statler Hotel, Cleveland, Ohio.

January 23-26—Plant Maintenance & Engineering Conference and Show. Convention Hall, Philadelphia, Pa.

January 30-February 3—American Institute of Electrical Engineers (AIEE), Hotel Statler, New York.

February 20-23—American Institute of Mining and Metallurgical Engineers, annual meeting, New York.

February 26-29—American Institute of Chemical Engineers, Los Angeles, Calif.

February 27-March 2—ASTM Committee Week, Hotel Statler, Buffalo, N. Y.

March 12-16—NACE annual conference and exhibition. Hotel Statler, N. Y.

March 14-16—ASME Aviation Division conference. Los Angeles, Calif.

March 18-20—Steel Founders' Society of America, annual meeting, Chicago.

March 18-21—ASME spring meeting, Portland, Oregon.

March 19-23—ASTE industrial exposition, Chicago, Ill.

March 26-27—ASME instruments and regulators division conference, Princeton, N. J.

AES

January 27—Editorial Board Meeting, Conrad Hilton Hotel, Chicago, Ill.

January 28—44th Annual Educational Session and Banquet, Chicago Branch, AES. Conrad Hilton Hotel, Chicago, Ill.

February 10-11—Annual Meeting, Educational Session and Banquet, Southeastern Branch, AES. Biltmore Hotel, Atlanta, Ga.

March 9—AES Research Committee Meeting. Hotel Biltmore, Dayton, Ohio.

March 10—Third Annual Tri-State Regional Meeting, AES. Hotel Biltmore, Dayton, Ohio.

April 7—New England Regional Meeting, AES. Hotel Statler, Hartford, Conn.

April 14—2nd Annual Empire State Regional Meeting, AES. Hotel Statler, Buffalo, N. Y.

April 21—Annual Educational Session and Banquet, Rockford Branch, AES. Faust Hotel.

May 5—Annual Regional Meeting, Toronto Branch, AES. Sheraton-Brock Hotel, Niagara Falls, Ontario, Canada.

June 17-21, 1956—43rd Annual Convention of the American Electroplaters' Society, Hotel Statler, Washington, D. C.

June 17-20, 1957—44th Annual Convention of the American Electroplaters' Society, Sheridan-Mt. Royal Hotel, Montreal, Canada.

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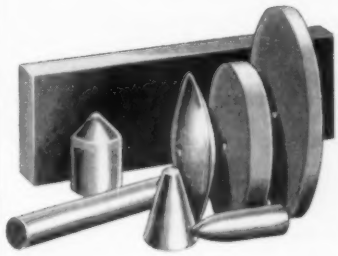

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